Education for a Digital World

ADVICE, GUIDELINES, AND EFFECTIVE PRACTICE
FROM AROUND THE GLOBE

Education for a Digital World:
Advice, Guidelines, and Effective Practice from Around the Globe

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Part 1: The Impact of Instructional Technologies

EMERGING TECHNOLOGIES IN E-LEARNING

Dr. Patricia Delich, Kevin Kelly, and Dr. Don McIntosh

Emerging technologies can have a far-reaching effect on how teachers teach and learners learn. The ability to harness these technologies in the design of online classrooms can impact the engagement of teaching and learning by creating more options for learners to connect with course content as well as to other learners. This chapter identifies several emerging technologies, describes how they will impact education, and explores the challenges that could arise due to the nature of current technology adoption models in education.

VIRTUAL DESIGN STUDIOS: SOLVING LEARNING PROBLEMS IN DEVELOPING COUNTRIES

Dr. Kris Kumar

Emerging technologies are moving the leading economies forward and, at the same time, enabling the developing world to leapfrog from their current status straight into the forefront of development. If they do not catch up with fast-growing potential technologies, the digital divide may leave them further behind than ever before! This chapter highlights the important role upcoming instructional technologies can play in Africa, Asia and elsewhere through the innovative use of Internet, Podcasting, Skype communications and desktop audio and videoconferencing. Studios for product design and architectural design need to be more than normal classrooms; they must provide design and drawing and modelling infrastructure, pin-up boards, and an inspirational environment. Connected global digital design studios can provide the digital equivalent of traditional studios, thus enabling global interactive and collaborative design more easily and accessibly. This chapter concludes with further thoughts on newer instructional technologies.

CHALLENGES CONFRONTED AND LESSONS (UN)LEARNED: LINKING STUDENTS FROM THE UNIVERSITY OF GHANA AND KWANTLEN UNIVERSITY COLLEGE

Dr. Charles Quist-Adade

While Canadian communications scholar Marshall McLuhan put us all in a "global village," the benefits of the village appear to elude a sizeable number of the villagers as the digital divide between the technology-haves and technology-have-nots grows ever wider and wider. Knowledge and ideas flow in a uni-directional, North-to-South (from the Global North to the Global South) fashion, with little going in the opposite direction. A lopsided flow of knowledge, values and ideas creates an atmosphere of mutual suspicion and recrimination, with some of the villagers complaining of "cultural imperialism" and others fending off such charges by saying they are only promoting the ideas of "democracy." But for the cultures of the "global village" to flourish in a tolerant, mutually beneficial fashion, it is imperative that there be real sharing of ideas, knowledge, and values. There is no better forum to address the ever-increasing need for mutual understanding and mutual respect across cultures and national borders than via collaborative learning. The British Columbia–Ghana Online Collaborative Learning Project (BCGOCLP) did just that.

ADDRESSING DIVERSITY

Dr. Madhumita Bhattacharya and Maggie Hartnett

The move towards globalization of education will be successful only if we can find the ways and strategies where people could collaborate and integrate to bring "Unity in Diversity", which is of utmost importance for world peace, sustainability of our rich cultures and progress together towards a better future. To address the emerging challenges and issues towards globalization of education we need instructional systems and supporting technologies which will give considerations to learner characteristics, dynamics of interactions and pedagogical principles for effective learning in a global context. It is not only diversity among people but also tools, technologies and strategies which are constantly changing. This chapter will include the possible ways of instructional and interaction design, modes of delivery and approaches to assessment, giving consideration to differences among the learners. This chapter will discuss guiding principles to address diversity in a constructive way through analysis of the impact of learning activity systems on the learning process.

MOBILE LEARNING IN DEVELOPING COUNTRIES: PRESENT REALITIES AND FUTURE POSSIBILITIES

Ken Banks

This chapter talks about how mobile phones are being used today, in a rather restricted technical space, in mobile learning initiatives in places like Africa, and then looks at what will become possible as new and higher-end phones work their way into these markets.

THE IMPACT OF TECHNOLOGY ON EDUCATION

Dr. Mohamed Ally

This chapter provides a brief history of technology in education, outlines the benefits of using emerging technologies in e-learning, provides design guidelines for developing learning materials, describes the support required for these technologies, and discusses future trends in e-learning.

Part 2: Preparing Online Courses

LEARNING MANAGEMENT SYSTEMS

Dr. Don McIntosh, with contributions from Kevin Kelly and Randy LaBonte

The Learning Management Systems chapter is a non-technical look at the features and capabilities of learning management systems for both corporate training and formal education use. It considers open-source systems as an alternative to commercial proprietary ones. It discusses the processes of needs analysis, selection, and implementation of the systems choices. Case studies are provided for illustration. It also describes technical and development standards and associated software such as course development/authoring tools, Learning Content Management Systems and virtual classroom tools.

EXPLORING OPEN SOURCE FOR EDUCATORS

Julia Hengstler

This chapter presents an overview of open source and free software with reference to programs of interest to educators. It distinguishes between the Free Software and Open Source Movements, describes why these types of software should be of particular interest to educators, highlights the importance of the General Public Licence, summarizes key challenges to adoption of freely sourced software, reviews common misperceptions about this software and provides a methodological framework for the potential adoption of such software. Citations include personal communications from Free Software Movement founder, Richard M. Stallman.

QUALITY ASSURANCE BY DESIGN

Niki Lambropoulos

A shift from the Industrial Age to the Information and Collaboration Age is evident in the changes in our lives. E-learning has become accessible to a wider population, providing flexible ways to learn, but it has not reached its potential. This chapter insists upon the importance of ensuring quality in the early stages of e-learning design. The design process must acknowledge the dual persona of the e-learner, as a learner and as a user of a system. This ongoing process is based on three pillars: the identification of a pedagogical focus or an existing problem; the integration of the design phases (analysis, design, development and use) unified by real-time evaluation; and awareness of the importance attached to e-learning communities in order to enhance collaborative learning, imagination, and co-creativity. Such a process provides information and feedback for proactive decision-making to support all participants in e-learning. Quality assurance by design helps e-learning to evolve and meet the requirements of the 21st century.

GENERAL PRINCIPLES OF ONLINE INSTRUCTIONAL DESIGN

Peter Fenrich

This chapter describes the instructional design process which is defined as a systematic, repetitive process of activities aimed at creating a solution for an instructional problem. It provides details and practical guidelines for completing the process. The instructional design process entails conducting a needs assessment, goal analysis, subordinate skills analysis, and learner analysis. This process also entails writing complete learning outcomes at the highest appropriate level based on a revised Bloom's taxonomy. The learner will ultimately be able to apply the skills learned in creating effective courses. This content will remain valid in the future in that the instructional design process is based on solid principles supported by years of research.

ACCESSIBILITY AND UNIVERSAL DESIGN

Natasha Boskic, Kirsten Starcher, Kevin Kelly, and Nathan Hapke

Great efforts have been made to give every student equal access to high-quality learning and to remove barriers for people with disabilities. However, most of these efforts are focused on the traditional, face-to-face classroom experience. Less attention is devoted to those taking courses fully online and their ability or inability to cope with web-based interactive content. While standards and guidelines have been developed to support and assist with accessible web design, their primary focus has been on technical specifications, assistive technologies, or legal issues. Fewer studies have been conducted to investigate how that "accessible" content is perceived from a learner's perspective and how helpful it really is. As distance learning adapts to new technology, instructors should be innovative in their relationship with students and in methods for developing educational content, accommodating the diverse needs and learning styles which will be beneficial for all, regardless of their (dis)abilities.

ARTICULATION AND TRANSFER OF ONLINE COURSES

Finola Finlay

Students are increasingly mobile, moving between post-secondary institutions and carrying their accumulated credits with them. They expect that they will receive appropriate transfer credit for relevant courses they have taken and be able to apply that credit to fulfill program requirements in the institutions they attend. Online learning has had a significant impact on mobility and transfer: students can and do access high-quality courses from all over the world. However, this virtual mobility creates challenges for post-secondary institutions. The articulation agreements used by institutions and systems to generate and record transfer credit arrangements have traditionally been negotiated locally and have concerned the assessment of courses offered in the familiar face-to-face classroom environment. Few resources exist that will assist practitioners at sending institutions to ensure the successful articulation of their online courses, and few provide evaluators at receiving institutions the tools they need to make confident decisions. This chapter aims to fill that gap.

PLANNING YOUR ONLINE COURSE

June Kaminski and Sylvia Currie

Where does the process of planning a course begin? Where does it end? What does a course plan look like, and how does it differ from a course design? This chapter provides an overview of the broad considerations in preparing an online course plan. A plan is a starting point for moving forward with the design, implementation, and evaluation of an online course.

- Who will you work with to design the course?
- Who will take the course and why?
- What do we know about the learners?
- How do instructor styles factor into the planning?
- What are the main components of the course?
- How will the course be organized?

Even the most open-ended learning activities begin with a plan. However, a plan will and should be refined and adjusted during implementation. In this sense a plan evolves, but it continues to provide a sidebar of sorts, or something to guide the decisions about the design work that needs be carried out. A plan can be both an ongoing reality check and a way to focus on important elements of course design.

ASSESSMENT AND EVALUATION

Dan O'Reilly and Kevin Kelly

This chapter reviews some of the basic issues of evaluation and assessment relevant to both online testing and authentic assessment techniques. While WebCT version 4.1 is the primary example, the information can be applied to most online platforms used in a lab setting.

The chapter begins by detailing some of the more important security issues for online testing, ones that generally are not covered in most reference material. It looks in detail at some third-party software, namely NetSupport and Excel, for managing computer labs. NetSupport provides a means of monitoring every computer in a lab from one workstation. Excel, through its web query function, provides a means of collecting data from any page in WebCT in order to monitor activity on that page. Detailed examples are provided for both packages. The quiz settings relevant to monitoring a WebCT quiz in a computer lab are discussed in detail.

Here, the discussion focuses on WebCT 4.1 and a computer lab environment. The chapter ends by describing other ways to evaluate student performance, such as using rubrics and peer review to evaluate writing assignments submitted electronically, or asking students to submit items within an electronic portfolio.

Part 3: Implementing Technology

UNDERSTANDING COPYRIGHT: KNOWING YOUR RIGHTS AND KNOWING WHEN YOU'RE RIGHT

Dan McGuire

This chapter features an explanation of the ethical and legal requirements that must be met before using copyright material in your online course.

'OPEN LICENCES' OF COPYRIGHT FOR AUTHORS, EDUCATORS, AND LIBRARIANS

Julien Hofman and Paul West

An open licence, as defined in this chapter, is a licence granted by someone who holds copyright in material, allowing anyone to use the material subject to the conditions in the licence but without having to pay a royalty or licence fee.

There are many different open licences, some for computer software and some for other forms of material. Each has its own terms, conditions and vocabulary. This chapter is an introduction to open licence language and to the open licences that are important for authors and educators. It is not legal advice. Individuals or institutions thinking of committing themselves to open licensing should get professional legal advice about the implications of the licences they are considering using.

E-LEARNING STANDARDS

Dr. Randy LaBonte

Standards exist for many things, from safety standards in the home for construction and manufactured goods to standards of practice for professionals. The systemic implementation of new technologies and delivery of online courses requires adoption of standards and specifications in both the development of e-learning content and its delivery through e-learning technologies. Standardizing the gauge of a railroad track enabled the locomotive to lay the groundwork for the industrial economy, and in much the same way in today's information age the Internet was born from the standardization of TCP/IP, HTTP, and HTML protocols for the World Wide Web. The historical emergence of standards for railway track gauge, as well as telephones, videotape/DVD formats, and HTML, typically started with proprietary technology that did not integrate with other technologies. End-users and consumers of the technology demanded changes that led to interoperability, enabling several products designed to serve common needs to coexist. This convergence of technologies provides the groundwork for the development and description of standards that provide end-users with assurance of longevity and consistency. Given the initial costs for developing e-learning programs, establishment of standards for e-learning is driven by similar demand for consistency and longevity of use by the end user.

LEADERSHIP AND E-LEARNING: CHANGE PROCESSES FOR IMPLEMENTING EDUCATIONAL TECHNOLOGIES

Dr. Randy LaBonte

It is one thing to have innovative technology and preach about its ability to transform and revolutionize learning; it is another to actually make this happen within traditional, structured education and training environments. Sound leadership and change management skills are key to implementing the use of new educational technologies to support e-learning programs and foster transformation. While leadership, reform and change management have been well studied and documented in the literature, little has been written about the role leaders play in the success or failure of e-learning program design, development and implementation. Traditional theoretical and practical constructs do not adequately reflect emerging e-learning environments, yet one theory, transformational leadership theory, does provide insight into fundamental assumptions about change, control, order, organizations, people and leadership in e-learning program implementation. Promising research affirms the critical role of leadership in systemic change for e-learning design, development and delivery, and confirms that without a clear vision combined with collaborative leadership organizations could end up committing precious resources to the development and deployment of courses for e-learning without much success.

BUILDING COMMUNITIES OF PRACTICE

Shawn Berney

This chapter focuses on the development of collaborative technologies that underpin a community of practice. The bottom-up approach provides the foundation for greater understanding of these emerging collaborative spaces. Concepts that underpin online engagement and evolving digital communication standards are addressed. These concepts provide the basis for examining operational and social processes, including administrative and technological frameworks, as well as leadership techniques. Modelling techniques are then described to show how to integrate foundational concepts with social and operational processes. These modelling techniques encourage interdisciplinary communication and broad engagement in community planning and development.

Part 4: E-learning in Action

INSTRUCTIONAL STRATEGY

Peter Fenrich

An instructional strategy describes the components and procedures used with instructional materials to have the students achieve the learning outcomes.

This chapter first introduces instructional strategies and discusses strategies for verbal information, intellectual skills, psychomotor skills, and attitudes. The chapter then describes how to sequence learning outcomes and then how to motivate learners in online courses. Instructional events, the foundation for course design, are then presented. After this a variety of instructional strategies are discussed that can support learners beyond the more common online strategies that are described in other parts of this book. The chapter closes with some comments on developing and selecting instructional materials.

MEDIA SELECTION

Peter Fenrich

A major part of the instructional design process is selecting the appropriate media mix to effectively teach the learning outcome(s). Selecting the best media mix can increase learning and maximize cost-effectiveness. Some concepts are extremely difficult to teach without the correct media mix.

This chapter introduces the different media categories: text, audio, visuals, video, animations, and real objects. The chapter explains how each medium relates to learning and describes how media can affect a learner's motivation. The strengths and weaknesses of each medium are presented with respect to the different learning outcome classifications, as previously discussed in Chapter 10, General Principles of Instructional Design. This chapter also provides ideas on how to keep the message clear.

COMPUTER-BASED RESOURCES FOR LEARNING

Peter Fenrich

This chapter focuses on the viability of virtually teaching lab, shop, and other practical skills. Topics include how educational technology may support learners, problems with "live" labs, instructional design, controlling real equipment, and how lab tests can be handled, as well as some thoughts on articulation and the future of online labs. The instructional design topic will address learning outcomes that focus on important skills, content areas that will be stronger or weaker than traditional labs, and strategies for effectively teaching lab skills online.

COMPUTER-BASED GAMES FOR LEARNING

Dr. Alice Ireland and Dr. David Kaufman

This chapter gives you a broad introduction to the use of computer-based games for learning. We start with basic terms and move on to look at why these activities can be powerful learning tools, drawing on current learning theory, game research, and recent experience. After presenting examples to spark your own learning-game ideas, we discuss factors that make learning games effective. The chapter closes with tips for successfully getting started using games in your learning context.

EVALUATING AND IMPROVING ONLINE TEACHING EFFECTIVENESS

Kevin Kelly

"Teaching effectiveness" is a broad term used to describe an instructor's ability to impact student success. It is usually defined according to several factors, such as how well an instructor organizes a course that contains relevant material, how well he or she knows the course material, how clearly he or she communicates with students, how frequently he or she provides timely feedback, and other such criteria. In classroom situations, effectiveness definitions sometimes include the instructor's enthusiasm or disposition. During fully online and blended learning courses, students often need greater amounts of structure and support to succeed because online course activities usually require students to take greater responsibility for their own learning success. Therefore, many of the criteria mentioned above take on even more importance when evaluating online teaching effectiveness.

Part 5: Engagement and Communication

TOOLS FOR ONLINE ENGAGEMENT AND COMMUNICATION

Richard S. Lavin, Paul A. Beaufait, and Joseph Tomei, with contribution from David Brear

This chapter combines two sections on relatively new technologies, blogs and wikis, with a third on digital storytelling, to introduce the possibilities of creating sets of many-to-many relations within and between classes, and to encourage educators to take up blogs, wikis, and digital storytelling in their classrooms as a way of returning to a state of "beginner's mind". These tools are not only powerful in and of themselves, but may have an even greater potential when used together. The first section on blogs argues that they may be the best all-round tool for computer-mediated communication (CMC), allowing learners and educators alike to build their online identities in a semi-enclosed space from which they can venture out on their own terms to engage with others. The following section on wikis points to possibilities of using these powerful tools for collaboration, suggesting that in many cases wikis work better when learners and educators already have a solid foundation in blogging. This section outlines work that attempts to merge the functions of blogs and wikis, and highlights issues associated with usability and flow. The third section takes up digital storytelling, to walk educators through the process of planning and creating their own stories, and to prepare them to teach their students how to do the same. The process of assembling various media and pieces of information into a story encourages deep learner engagement, and can be a wonderfully effective way to master curricular content, while helping to encourage development of computer literacy. Blogs, wikis, and digital media are but a narrow selection of the tools for online engagement, but we feel they cast a wide enough net to familiarize readers with some of the options that now exist.

TECHNO EXPRESSION

Kevin Kelly and Dr. Ruth Cox

This chapter lays a foundation for online teachers to recognize K–12 and postsecondary students' needs to express their ideas and viewpoints, both within and outside the context of their coursework. There is a human at the other end of each web page, discussion thread, chat entry, blog, or wiki contribution. We outline specific strategies to create a safe environment for techno expression, and offer specific examples of how educators can model and encourage this expression through various technological means. We also describe various tools that instructors can use to facilitate the process. This chapter complements Chapters 25, 26, and 27 related to instructor and student engagement by looking at course design, effective online practices, and technological tools that give students opportunities to express themselves.

SOCIAL MEDIA FOR ADULT ONLINE LEARNERS AND EDUCATORS

Moira Hunter

Social media allows working adult learners to be connected, and encourages them to use all four language skills of reading, writing, listening and speaking.

The cluster of technologies in one support does not overload the learner in their immediate need to learn what they need and to access their learning environment at any time, and anywhere.

The online environment engages the learners in discussion, collaboration, exploration, production, discovery and creation.

Adult learners have the choice to create and develop their own personal learning environment.

ONLINE COLLABORATION: AN OVERVIEW

Paul A. Beaufait, Richard S. Lavin, and Joseph Tomei

In this chapter we explore the notion of collaborative learning from theoretical as well as practical perspectives. Our first step is to distinguish collaborative from cooperative learning, because much so-called collaborative learning, although collective and often cooperative, is not necessarily collaborative. We attempt to clarify what we may be failing to do when attempting to foster collaboration, prior to formulating clearer ideas of what else is possible, and what is transferable to online learning and working environments. With rapid development and expansion of technological infrastructures, possibilities for harnessing technology to enable collaboration are expanding. Yet, as we move to take advantage of these possibilities, we encounter new challenges and discover unexpected complexities in fostering collaborative endeavours online. The chapter concludes with stories and reflections representing online educational collaboration from learners' and educators' perspectives.

IDENTITY IN ONLINE EDUCATION

Joseph Tomei, Paul A. Beaufait, and Richard S. Lavin, with contributions from Tod Anderson, Kathryn Chang Barker, Karen Barnstable, and Lynn Kirkland Harvey

In this chapter we suggest that identity is the base from which learners' engagement with content, as well as communication with others, begins. As students establish their identities, they have to negotiate and engage with other students, and in online courses channels for negotiation and engagement are necessarily different from those in traditional classrooms. The power of online classrooms arises not simply out of their time- and space-shifting potentials, but also from the potential for diverse sets of many-to-many relationships as students engage with each other. Many of the lessons that we aim to teach students are not simply to do with mastering course content, but also involve understandings of issues involved in working with others and collaborating towards shared goals. Deliberate appraisals of learners' identities in online environments can help us realize these aims. This position is supported by Tod Anderson's summary of secondary student participation in online learning, which provides a snapshot for technological understanding from a locale that might represent a best-case scenario—or at least a fairly advanced one—in which the technologies in use have to a large extent been adopted from higher education. We note that secondary schools face many of the same issues that tertiary and adult educators began grappling with years ago and continue to face today. These observations provide a springboard into a wide-ranging discussion of online learners' identities, underscoring the necessity for considering learners' identities from the very beginning of online work, rather than just as a concern of secondary and tertiary educators. The chapter concludes with a concrete example of identity construction and a possible end point to online education in the form of Kathryn Chang Barker and Karen Barnstable's discussion of e-portfolios.

SUPPORTING E-LEARNING THROUGH COMMUNITIES OF PRACTICE

Dr. David Kaufman, Kevin Kelly, and Dr. Alice Ireland

This chapter examines the theoretical and practical aspects of community of practice (CoP). It presents a practical guide to developing and maintaining your own CoP. It also provides an overview of the conceptual foundations of CoPs. Case studies throughout the chapter describe the conception, growth, challenges and triumphs of several CoPs in action.

LOOKING FORWARD: STORIES OF PRACTICE

Dr. Susan Crichton and Dr. Elizabeth Childs

Much of the contemporary literature about online and/or blended learning casts it as innovative, and talk abounds about leading edge technologies supporting teaching and learning opportunities for K–12 education, post-secondary education, and corporate training. Typically, both are about flexible access and increased learning opportunities.

In the K–12 or post-secondary educational environment, these learning options enable students to complete work that they wouldn't otherwise be able to do. Initially, this audience included students with an extended illness or disability who were now able to complete course work that otherwise they would miss or be required to take again. It also included rural students who were unable to have access to courses required for post-secondary entrance. Increasingly, this audience has expanded to include any student who is working towards their personal learning goals and needs access to courses and/or content at their pace and in their timeframe.

Introduction

Enlisting the practice-based knowledge of educators to address the aspirations and goals of today's information-savvy students is surely a key to providing enriching experiences using learning technologies.

Faculty, instructors, staff, administrators, policy makers and governance bodies have their own unique perspectives on the role of learning technologies within higher education and each has a sense of what would constitute an enriching experience. That experience might include highly flexible and engaging course offerings, convivial tools for instructors, more learners for academic departments, increased recognition and reputation for an institution, more mobility for learners between programs and across institutions—items with specific success indicators, depending on viewpoint.

But despite the proliferation of information and communication technologies (ICTs) within the higher education sector, ICT use in higher education may not yet have made as significant an impact on the fundamentals of teaching and learning nor revolutionized classroom practice as predicted, according to a report on tertiary education from the Organisation for Economic Cooperation and Development (OECD, 2005).[1] Instead, the report pointed to administrative services such as admissions, registration, fee payment, and purchasing as areas of measurable ICT impact. ICT use may have changed the nature of the learning experience for many learners, providing convenient access to information resources from libraries and online databases, and it may have relaxed the time, space, and distance constraints of education. But the fundamentals of how higher education institutions teach or the ways that learners learn has remained largely unchanged—until now.

How do we currently approach the enrichment of teaching and learning using ICTs? Are there emergent models of practice arising from educator experiences that may apply broadly to ICT applications for teaching and learning? Are there best practices with learning technologies emerging from particular institutions or jurisdictions that could have wider application across the higher education sector? How has the proliferation of ICTs, and particularly mobile technologies, been incorporated by educators into their practice in diverse communities around the globe?

This book addresses these questions. It was collaboratively developed and edited by experienced practitioners in the higher education sector. It is the output of ongoing discussions among practitioners who participated in an online community of interest that stimulated dialog among and between interest groups that shared a common vision of providing best practice knowledge for the benefit of their peers. This is a book that had its roots in the organic discussions of practitioners and became a larger work through their collective intention to disseminate their knowledge more broadly.

The book addresses issues of learning technology use in five sections that deal with:

- The impact of instructional technologies
- Creating online course
- Implementing technology
- E-learning in action
- Engagement and communication

In Part 1, the book provides a view of the many ways in which information technologies can be configured to suit the diverse range of situations in which learning can take place, including descriptions of emergent approaches such as those afforded by social networking technologies and collaboration tools. Part 1 also flags issues of diversity, as well as the challenges and opportunities for ICT use in the developing world.

In Part 2, the book provides insights into key design issues in the creation of online courses, including matters of instructional design, assessment and evaluation, diversity, accessibility, quality assurance, and the impacts associated with making technological choices in an instructional context.

In Part 3, the book explores issues of leadership and change management with chapters that discuss copyright and licensing, the implementation of learning management systems, the use of emerging open source tools and open educational resources, and the development and maintenance of standards of practice. It em-

[1] OECD (2005). *E-learning in tertiary education: where do we stand?* Organisation for Economic Cooperation and Development (OECD). Paris.

phasizes the building of communities of practice as a means of sustaining innovation in the context of a dynamically evolving instructional ecosystem.

From the action perspective, in Part 4 the book provides chapters on instructional strategies, selection of media, the use of games, and the evaluation and improvement of instructional practices.

In Part 5, the book deals with the tools for engagement and communication and their use as a means for expression, as well as for giving voice to learner identities and communicating their stories. The authors discuss the power of communities of practice as a tool for sustaining change and maintaining colleague support as we look forward to what may be next on the learning technologies horizon.

In a paper describing the creation of a national e-learning strategy for New Zealand, Higgins (2002) described the "way forward" as a learner-centred approach that encompassed the complete range of interactions between learners and the higher education system. "E-learning can deliver many benefits, but only if learner-centred opportunities are developed that ensure it is an effective educational tool. This means giving learners much greater choice in how their learning is delivered, enabling them to interact easily with teachers and access appropriate levels of administrative, educational, and technical support. It means designing our systems in ways that best fit the circumstances and needs of our learners."[2]

What Higgins was describing was the need for a technological approach to the issues of access, choice, flexibility, and mobility within the higher education system using ICTs and learning technologies that can enhance the functional aspects of the entire higher education ecosystem. It is from an ecological perspective that the authors of this work present emerging practitioner knowledge for enriching learning and teaching using learning technologies. In this book, the authors have described and evaluated instructional approaches that draw upon technological innovations with the power to change teaching and learning practices in positive and transformative ways.

From the perspectives outlined in this book there is a wealth of available practitioner knowledge on the use of learning technologies that requires additional dissemination. This book is one potential creative outlet. And, as the authors have demonstrated through their approach to disseminating their work online, the power of ICTs may only now be emerging in the hands of practitioners who actively dialogue with their peers on relevant issues as a means to elevate the use of learning technologies to a transformative plane in the higher education sector.

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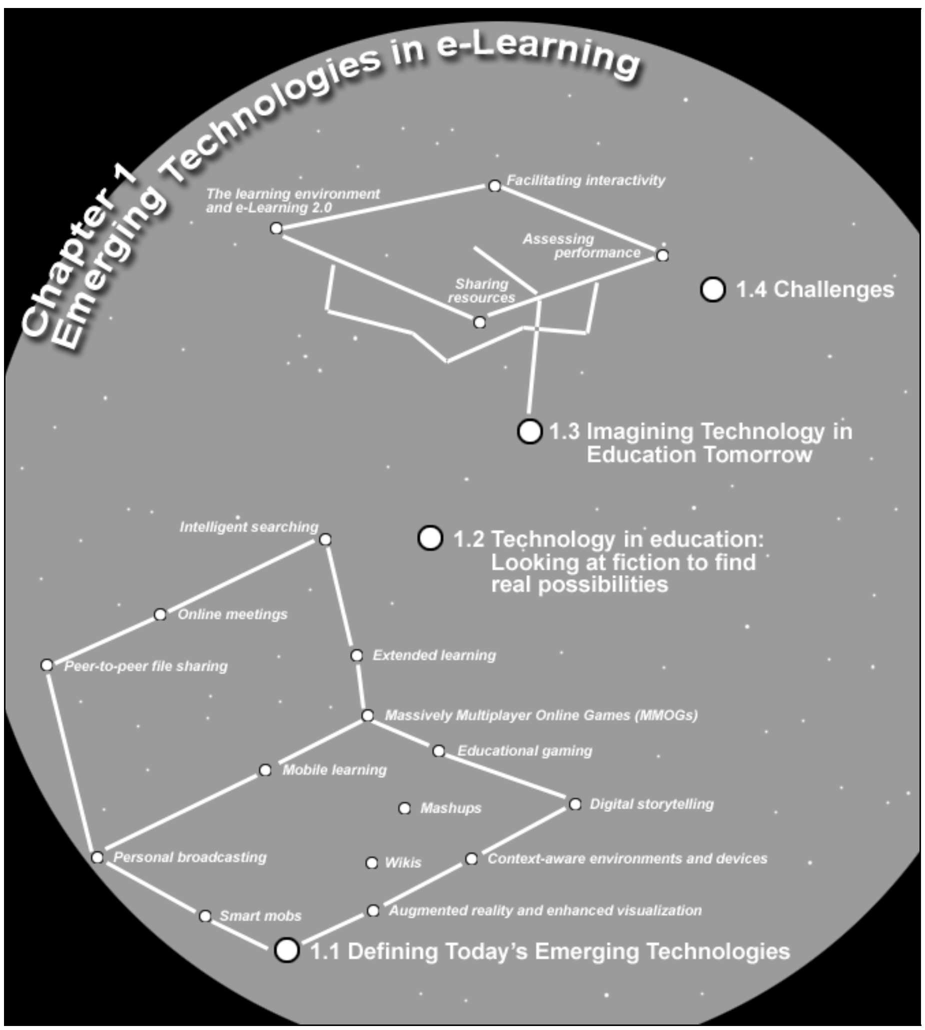
[2] Higgins, A. (2002). *Creating a National E-Learning Strategy in the Open Learning Environment: A New Zealand Case Study*. Distance Education Association of New Zealand. Available: http://www.col.org/pcf2/papers%5Chiggins_1.pdf

Part 1: The Impact of Instructional Technologies

1
Emerging Technologies in E-learning

Patricia Delich, Kevin Kelly, and Don McIntosh

Creativity is an important part of modern teaching and learning. It makes sense to take students' ideas and upgrade them using emerging twenty-first century technology. – Scott (2006)



Learning outcomes

After completing this chapter, you should be able to:

- Identify several different emerging technologies.
- Incorporate emerging technologies in teaching and learning activities to engage learners.
- Explain how emerging technologies will affect education, and vice versa.
- Identify the challenges organizations face in adopting emerging technologies.

Introduction

As the capacity of the Internet evolves and expands, the potential for online teaching and learning also evolves and expands. The increasing number of new technology tools and expanding bandwidth are changing all facets of online activity, including e-learning. As technologies become more sophisticated and as they begin to converge (for example, cell phones becoming multimedia-capable and Internet-connected), educators will have more options for creating innovative practices in education.

The shift occurring in the Web from a static content environment where end users are the recipients of information—defined as Web 1.0—to one where they are active content creators—defined as **Web 2.0**—can be described as a transition to a more distributed, participatory, and collaborative environment (Wikipedia, 2005). Web 2.0 is considered to be a platform where "knowledge-working is no longer thought of as the gathering and accumulation of facts, but rather, the riding of waves in a dynamic environment" (Downes, 2005, para. 14). Web 2.0 is defined not only by technologies such as **blog**s, **wikis**, **podcasts**, **vodcasts**, **RSS** feeds, and Google Maps, but also by the social networking that it enables. As these communication-enabling technologies conjoin text, voice, and video using **CoIP** (communications over Internet protocol), they will provide a seamless integration with cell phones, personal digital assistants (PDAs), and computers (Yarlagadda, 2005). Web 2.0 technologies can bring people together in ways Web 1.0 did not.

At the beginning of any technological change, several definitions often encompass a new concept. This is also true with Web 2.0. In an interview with Ryan Singel (2005), Ross Mayfield, CEO of a company that creates wiki software, offered this simple definition: "Web 1.0 was commerce. Web 2.0 is people" (Singel, 2005, para. 6). Tim O'Reilly, who wrote one of the seminal articles on Web 2.0, saw it as an "architecture of participation" (O'Reilly, 2005, para. 26) and "not something new, but rather a fuller realization of the true potential of the web platform" (para. 88). Web 2.0 is centred on communication—the ability to interconnect with content, ideas, and with those who create them. Social networking is a key phrase for Web 2.0. The Web 2.0 framework sets the stage for a student-centred collaborative learning environment. Using existing communication tools in a way that encourages collaboration can be a step in the direction of incorporating the spirit of Web 2.0 philosophies in online learning environments.

A parallel can be drawn between the shift from Web 1.0 to Web 2.0 and the shift many instructors are making in online learning from an instructor-centred (Web 1.0) approach to a student-centred (Web 2.0) approach where students have more control over their learning. The effects of Web 2.0 may influence how online courses are conceptualized, developed, and taught. The use of Web 2.0 technologies and philosophies in education and training are sometimes referred to as "e-learning 2.0" (Cross, 2005; Downes, 2005; Wilson, 2005).

Currently, Web 2.0 technologies are just beginning to affect online teaching and learning. As the Web becomes more interactive, instructors will want to incorporate these technologies effectively. It is likely that Web 2.0 technologies will affect student-to-student communications in project-based learning, as it will affect ways in which instructors conceptualize, develop, and teach their courses. Incorporating Web 2.0 technologies and philosophies can make courses more student-centred.

Web 2.0 technology emphasizes social networking. Online learning environments can be used for enhanced communication among students, as well as between students and the instructor. Creating learning opportunities that harness the power of Web 2.0 technologies for collaborative learning, distributed knowledge sharing, and the creation of media-rich **learning objects** can further the scope of what students can learn by "placing … the control of learning itself into the hands of the learner" (Downes, 2005, para. 12). These tools provide an avenue for students to spend more time on task, from sharing ideas and their understanding of the course content to collaborating in creating artifacts that represent their learning, whether in a traditional or an online classroom.

A few ways Web 2.0 technologies can support project-based learning include: blogs for journaling assignments, wikis for creating content in collaborative group projects, podcasts for audio-based assignments, vodcasts for video-based assignments, and RSS feeds for syndication. The creativity and remixing of technologies is an exciting new direction for both instructors and students.

Several chapters in this book address these ideas in greater detail.

Creating online courses in which students construct their own meaning with hands-on activities may radically change how teaching and learning is designed. Delivering an online course with content created by either a publisher or an instructor alone is no longer considered an effective strategy. Students working in environments that shift learning to knowledge construction rather than by assimilating what the instructor delivers will create courses that "resemble a language or conversation rather than a book or manual" (Downes, 2005, para. 32).

Web 2.0 technologies and their use in teaching and learning are currently in a nascent state. Further research on the adoption and use of Web 2.0 technologies, and their effects on teacher philosophies with respect to teaching and learning, will deepen our understanding of how to use these technologies to design courses that engage and retain students.

Defining today's emerging technologies

For some instructors, integrating technology into their teaching can be an overwhelming task. Adding the word "emerging" can make these technologies seem impractical, unnatural, or counter-intuitive, as well as implying hat the technology is transient. Although technology is constantly changing, using it for instructional goals can make a difference in a successful adoption and implementation.

As the authors of this chapter, we firmly believe in the use of technology for teaching and learning purposes. In this section, we will describe several currently emerging technologies. Johnson (2006) provides a list of emerging technology links on his website. Using his list as a base, we provide definitions, as well as examples of how these technologies can be used in teaching and learning. The list below is not in any particular order.

Digital storytelling

Storytelling is one of the oldest teaching methods. By using digital video cameras and software such as iMovie, almost anyone can extend a story's reach to a much wider audience. In education, instructors can ask students to create digital stories to demonstrate knowledge of a topic. Websites such as the Center for Digital Storytelling emphasize that the technology is "always secondary to the storytelling" (Banaszewski, 2002, para. 18). See Chapter 25, Tools for Online Engagement and Communication, for more information on digital storytelling.

Online meetings

Synchronous meetings of online classes can be facilitated by the use of **web conferencing**/virtual classroom tools such as WebEx, Wimba, Elluminate, Skype, Microsoft Live Meeting, Adobe Breeze, Centra, and Interwise. These technologies add presentation and group interaction tools. Most of them provide both voice and text chat functionality. Their synchronous nature appeals to many people and complements other **asynchronous** activities. Huge savings in travel costs can be realized by conducting meetings over the Internet. For a geographically widespread class or working group, occasional online meetings can help to keep people on track and provide a valuable opportunity for synchronous discussions.

Communities of practice

Much of **social computing** revolves around the formation of **communities of practice**, which are groups with a common interest. With technologies that ease the sharing of experiences, information, and resources, whether across the hall or around the world, many communities of practice are developing spontaneously, or are intentionally created by an individual or organization to meet a specific purpose. Communities of practice use social computing tools and often form as a result of the availability of the tool. They can contribute greatly to the dissemination of knowledge and skills within an organization, as when, for example, the group serves as mentor to a new member.

Communities of practice are not a technology, but rather a learning theory that can make use of many of the emerging technologies available today. For more information on communities of practice, see Chapter 30, Supporting Learning Through Communities of Practice.

Personal broadcasting

Personal broadcasting tools include: blogs (web logs), **moblogs** (mobile blogs), **vlog**s (video blogs), podcasts, vodcasts (video podcasts), and RSS feeds with uploaded images from cell phones. Instructors can use these technologies to bring diverse elements into a course to assist in meeting a variety of learning styles. These technologies can also be used for updating students on current activities and projects.

Podcasting and videoblogs can assist learners whose learning style is primarily auditory. Some uses include recording lectures for students to review, providing more clarity for difficult concepts, and supplementing lecture information such as, for example, guest lectures and interviews.

RSS feeds allow students to selectively download updates from targeted sources, personalizing the information and news they want to receive. Tools such as Suprglu allow multiple RSS feeds on one Web page. Stead, Sharpe, Anderson, Cych & Philpott (2006) suggest the following learning ideas for Suprglu:

- Aggregate all of a student's production in one page.
- Bring a range of different search feeds together for easy viewing.
- Create a class site that aggregates whatever content feeds you are providing for students.
- Create a collaborative project site.
- Bring teacher lesson plans or ideas together on one page (p. 37).

Personal broadcasting technologies give students an opportunity to participate in the creative construction of knowledge and project-related work. People can share their broadcasts on their own websites or through sites that specialize in specific types of broadcasting, such as wordpress.com for blogs or youtube.com for vlogs. YouTube's tagline captures the essence of personal broadcasting: "Broadcast Yourself."

Wikis

Wikis are a type of website that allows visitors to easily add, remove, and otherwise edit the content. This ease of interaction makes wikis an effective tool for collaborative authoring. In a short time Wikipedia (Wikipedia, 2006d) has become a primary reference tool for many students, though by the readily editable nature of its information, it cannot be considered authoritative. Wikis can be useful as a tool for students to build their own knowledge base on specific topics and for sharing, comparing, and consolidating that knowledge.

Educational gaming

Despite the vast interest in video and computer games, the educational game market still has a long way to go. Many people have heard of Warcraft, a strategy game, and Halo, a battlefield simulation game, but how many people have heard of Millie's Math House, a learning game? However, as Web 2.0 puts more power in the hands of mere mortals, teachers will start making better learning games than the commercial game producers. These games will also take advantage of new technologies. For example, low-cost virtual reality gloves give middle school students the ability to play "Virtual Operation." John Shaffer (2002) describes a variety of educational learning experiences that virtual reality could present to middle school, high school and even college students.

Several renowned organizations have turned to educational games to attract young people to their disciplines or movements. The Nobel Foundation uses educational games on its website to teach different prize-winning concepts in the areas of chemistry, physics, medicine, literature, economics, and world peace. The Federation of American Scientists has created engaging games that ask players to discover Babylon as archaeologists and to fight off attacks as part of the human immune system. Instructors do not have to be game designers to incorporate existing educational games into their curriculum. They may want to play the games first, both to make sure they address course concepts and to have fun!

Massively multiplayer online games (MMOGs)

Interacting online within the same game environment, hundreds, if not thousands of people gather together to play in MMOGs. In Worlds of Warcraft, one popular game, players can choose roles as a human, elf, orc, or other creature that works with others to accomplish goals. In the future, students will choose whether they will play as red blood cells, white blood cells, viruses, or anti-viral drugs to learn how viruses affect the body, and how to stop them. Currently, gamers seek treasures to score points and gain levels in an MMOG called Everquest. In the future, students will use MMOGs in an online environment depicting the historical period to seek answers to instructors' questions about World War II such as, "How did women influence the end of World War II?"

Extended learning

Also known as hybrid or blended learning, extended learning mixes instructional modalities to provide an ideal learning solution, using e-learning and classroom training where each is most appropriate. It may also be a mix of synchronous and asynchronous technologies. Using both online and in-person methodologies allows instruction to be designed to address diverse learning styles, as well as meet the course's learning objectives. For example, learners might use e-learning for the basic content, but meet face-to-face in a laboratory, or in a classroom.

Intelligent searching

Google and other search engines are already the most used learning tools around. Many people use them daily to do research and to find all kinds of information.

Some librarians have noticed that students are not learning how to use journal databases and other sources of materials because of their over-reliance on Google. Search engines will evolve to provide more concept- and context-sensitive searching. Currently these have emerged in specific content areas such as Google Maps, Google Scholar, a self-adapting community system using Gnooks, video and audio using Blinx and StumbleUpon, which uses ratings to form **collaborative opinions** on website quality.

Intelligent searching will use such tools as vision technology (for images), natural language processing, and personalization by users to make them more usable and useful. Ask.com uses what it calls ExpertRank (Ask.com, 2006). This technology ranks pages based on the number of links that point to it rather than by how popular it is. Known as subject-specific popularity, this technology identifies topics as well as experts on those topics. Search engines will also become learning and content management systems that will help us organize, catalogue, and retrieve our own important information more easily.

Webcams and video from cell phones

Digital cameras, video cameras, **webcams**, and video from cell phones have become almost ubiquitous as ways to capture personal history. But they have gone far beyond that and have become a means of communication. People have captured events like weather, subway bombings, and funny incidents that have become part of television entertainment and news. Thanks to sites like Flickr and YouTube, online videos have become a pervasive online feature.

Examples of educational uses include: a source of data for student projects, a way to practise skills, document events, record interviews, and add video to videoblogs (vlogs). Instructors might use them to emphasize or explain important or difficult-to-understand concepts. The use of video provides learners with an alternative medium for grasping concepts when text or images alone don't convey the necessary information.

Mashups

(Lightweight, tactical integration of multi-sourced applications.) "A **mashup** is a website or web application that seamlessly combines content from more than one source into an integrated experience" (Wikipedia, 2006a, para. 1). Mashups take advantage of public interfaces or application programming interfaces (APIs) to gather content together in one place.

Tracking the Avian Flu, which tracks global outbreaks, is an example of how content is integrated with Google Maps. Top City Books is another example; this site shows the top 10 books in a city for eight subjects.

SecretPrices.com is a comparison-shopping site with customer reviews, information on deals, and more. It uses **API**s from Amazon.com, Shopping.com, and A9 and gathers information from Amazon.com and Epinions.com.

Cookin' with Google aggregates several databases. Type in a few ingredients you have on hand and Google searches databases with recipes containing those ingredients and presents a list of recipes you can consider cooking for dinner tonight.

Social computing

Social computing is the essence of Web 2.0. It is the use of technologies such as wikis, blogs, and podcasting by individuals and groups to create content, instead of simply being content recipients. Web 1.0 was about downloading; Web 2.0 is about uploading.

Forrester Research describes social computing as "[e]asy connections brought about by cheap devices, modular content, and shared computing resources [that] are having a profound impact on our global economy and social structure. Individuals increasingly take cues from one another rather than from institutional sources like corporations, media outlets, religions, and political bodies. To thrive in an era of social computing, companies must abandon top-down management and communication tactics, weave communities into their products and services, use employees and partners as marketers, and become part of a living fabric of brand loyalists" (Charron, Favier & Li, 2006, para. 1).

In an e-learning context, social computing is about students becoming the creators as well as the consumers of content. In a formal setting, students can be encouraged to use social computing technologies to share their experiences and collaborate on assignments and projects. In informal situations, people will be able to find great treasuries of information on almost any imaginable topic and contribute their own knowledge to it.

A new category of software has emerged called social networking software. This web-based software assists people to connect with one another. Examples of social networking software include Flickr, MySpace, Facebook, YouTube, Plaxo, and LinkedIn.

Peer-to-peer file sharing

In a peer-to-peer (P2P) network, files are shared directly between computers without going through a server. P2P applications are usually web-based and use peer-to-peer file sharing. Some examples include online meeting (web conferencing), instant messaging, Skype, Groove, Festoon, and BitTorrent. "P2P merges learning and work, shedding light on team processes that used to disappear when a project's participants dispersed. For example, P2P applications can create an audit trail" (Cross, 2001, para. 13).

Despite the copyright controversy around music file sharing on Napster, Kazaa, and others, P2P is a useful technology that offers opportunities for e-learning. P2P file sharing can support students working together on collaborative projects. Having one central location for group members to access and edit a master copy of a shared document can help with version control. Another benefit in collaborative work is the ability to view and mark up a master copy instead of sending documents as attachments through email. This can help avoid confusion over who has the master copy and the problem of edits accidentally missed or overwritten. P2P technologies also enable chatrooms and online groups, where students can talk synchronously about their project. Using a P2P application such as Groove, students can create a shared virtual office space for group projects (Hoffman, 2002). P2P technologies can possibility encourage project-based learning.

Another technology related to both P2P and podcasting is **swarmcasting**. Because files are transported across the network in smaller packets, swarmcasting is a more efficient way to send large files such as video files. Swarmcasting provides the possibility of Internet broadcasting much like a television station does (tvover.net, 2005).

Mobile learning

Also called **m-learning**, this represents an evolution of e-learning to the almost ubiquitous mobile environment for laptop computers, cell phones, PDAs, iPods, and **RFID** (radio frequency identification) tags. Technologies like **GPS** and Bluetooth will also enable the adoption of m-learning.

Learning will be in smaller chunks and designed as just-in-time (**performance support**) to accommodate wireless form factors, the flood of available information, and multi-tasking users. It is an opportunity for people to learn anytime, anywhere. An executive heading to a meeting can brush up on his or her facts, and students can study for an upcoming test or access information needed for a research project.

Using mobile devices for learning is the logical next step for e-learning. It will require some new strategies—smaller chunks of information, shorter modules, efficient searching for learning objects, and an orientation to performance support rather than information dumps (Wagner, 2006).

Examples of m-learning include:

- **SMS** (text messaging) as a skills check or for collecting feedback
- audio-based learning (iPods, MP3 players, podcasting)
- Java quizzes to download to colour-screen phones
- specific learning modules on PDAs
- media collection using camera-phones
- online publishing or blogging using SMS, MMS (picture and audio messages), cameras, email, and the Web
- field trips using GPS and positional tools (Stead et al., 2006, p. 12)

Mobile learning is already making an impact. In a recent survey conducted by the eLearning Guild, Pulichino (2006) reported that 16 percent of the responding organizations are currently using mobile learning and 26 percent expect to do so over the next 12 months. He also observed that colleges and universities are ahead of corporations in its adoption.

Context-aware environments and devices

Environments and devices that are tuned into the needs of those using them and automatically adjust to the situation are considered to be context-aware. Everyday devices such as phones, personal digital assistants (PDAs), and multimedia units equipped with built-in software and interfaces can be made context-aware. The strength of this technology is its ability for learners to extend their interaction with an environment. One example is the integration of student services with a PDA device. A student points a PDA to a computing device, and the PDA captures the information about the service which is beamed into the PDA. For more information on context-aware environments and devices, use a search engine with the parameters "Cooltown + HP."

Augmented reality and enhanced visualization

Augmented reality (AR) is an evolution of the concept of virtual reality. It is a hybrid environment, which is a combination of a physical environment with virtual elements added by computer input. This computer input augments the scene with additional information. While virtual reality strives for a totally immersive environment, an augmented reality system maintains a sense of presence in the physical world. Augmented reality's goal is to blur both worlds so the end user doesn't detect the differences between the two.

Augmented reality may use some of the following technologies:

Display technologies:

- high-definition, wall-sized display screens
- three-dimensional displays
- handheld mini-projectors
- glasses-mounted, near-to-eye displays
- flexible, paper-like displays
- full-face virtual-reality (3D) helmets

Multi-sensory inputs and outputs (see Stead, Sharpe, Anderson, Cych & Philpott, 2006):

- speech
- smell
- movements, gestures, and emotional states
- tangible user interfaces using the direct manipulation of physical objects
- handheld PCs for user input and data
- GPS (global positioning system) units
- wearable sensors

Examples of augmented reality applications include:

- image-guided surgery in medicine
- movie and television special effects
- airplane cockpit training
- computer-generated images for engineering design
- simulation of major manufacturing environments

Augmented reality is most often used to generate complex, immersive **simulations**. Simulations are powerful learning tools that provide a safe environment for learners to practise skills and conduct experiments.

Integrating the physical world and computer input is obviously an expensive technical challenge, and it is mainly a research field at this time. Up to now, the potential training applications are limited to medical, military, and flight training; but as costs come down, the possibilities for simulations in all fields are limited only by the imagination.

Many research projects are being carried out in this area. For more information on augmented reality, see Sony's Computer Science Laboratory (http://www.csl.sony.co.jp/project/ar/ref.html) and the thesis abstract at http://www.se.rit.edu/~jrv/research/ar/introduction.html.

Smart mobs

Rheingold, the author of *Smart Mobs*, considers **smart mobs** to be "the next social revolution" (Rheingold, 2006, para. 1) combining "mobile communication, pervasive computing, wireless networks, [and] collective action" (para. 1)

Two well-known examples of smart mobs involved events in the US as well as in the Philippines: "Street demonstrators in the 1999 anti-WTO protests used dynamically updated websites, cell phones, and 'swarming' tactics in the 'battle of Seattle.' A million Filipinos toppled President Estrada through public demonstrations organized through salvos of text messages" (Rheingold, 2006, para. 2).

In education, instead of smart mobs protesting a political decision, smart study groups will form to prepare for quizzes or to provide feedback about written assignments before submitting them for a grade.

WEBSITES MENTIONED IN THIS SECTION

- Emerging Technology Links: http://www.u.arizona.edu/~cgj/emerging
- Center for Digital Storytelling: http://www.storycenter.org
- Suprglu: http://www.superglu.com
- Nobel Prize: http://nobelprize.org/educational_games
- Google Maps: http://maps.google.com
- Google Scholar: http://scholar.google.com
- Gnooks: http://www.gnooks.com
- Blinx: http://www.blinkx.tv
- StumbleUpon: http://www.stumbleupon.com
- Ask.com: http://www.ask.com
- Flickr: http://www.flickr.com
- YouTube: http://www.youtube.com
- Tracking the Avian Flu: http://www.futurecrisis.com/places/view.php
- Top City Books: http://www.topcitybooks.com
- SecretPrices.com: http://www.secretprices.com
- Cookin' with Google: http://www.researchbuzz.org/wp/tools/cookin-with-google
- MySpace: http://myspace.com
- Facebook: http://facebook.com
- Plaxo: http://www.plaxo.com
- LinkedIn: http://www.linkedin.com
- Augmented Reality: http://www.csl.sony.co.jp/project/ar/ref.html
- Smart Mobs: http://smartmobs.com
- For a list of the latest mashups, go to: http://coolgooglemaps.blogspot.com and http://www.programmableweb.com.
- For a list of social networking links go to: http://socialsoftware.weblogsinc.com/2005/02/14/home-of-the-social-networking-services-meta-list

Technology in education: looking at fiction to find real possibilities

In his "lost novel," *Paris in the 20th Century*, science fiction author Jules Verne predicted gasoline-powered automobiles, high-speed trains, calculators, the concept of the Internet, and several other technologies invented well after 1863. Verne believed strongly that humans could realize all such predictions: "Anything one man can imagine, other men can make real" (Verne, n.d., para. 1). As scientists in various fields may have taken their cues from Jules Verne, we too can get some ideas about the future of technology and education from science fiction.

Looking at some science fiction within the past 15 years, we will start with predictions that are less far-reaching than those contained within Jules Verne's works. For example, in 1993 a low-grade action movie called *Demolition Man* depicted a teacher in the year 2023 talking to distance learners who attended class via individual video monitors placed around an empty table. The students' heads, as shown on the monitors, followed the instructor's movements as he paced around the room. Most or all aspects of this scenario are already possible with today's videoconferencing solutions, high bandwidth connectivity, and cameras that use infrared beams to automatically follow a moving subject. Three years ago, Florence Olsen (2003) depicted immersive videoconferencing solutions with virtual students beamed into another classroom hundreds of miles away. In some cases, perhaps, Moore's Law—computer-processing power, measured by the number of transistors on integrated circuits, doubling every 18 months—makes it more difficult to look too far into the future because the future arrives so much more quickly.

At the same time, when we read Neal Stephenson's *The Diamond Age,* we can see the potential to realize some of his predictions in less dramatic fashion. For example, when people first study sign language, they may dream about signing in full sentences, even though they cannot yet sign in the waking world. In this scenario, the brain contains the previously learned phrases in a mental "database" and stitches them together in new ways during the dream. Soon some instructional designer will put a comprehensive set of sign language video clips into an online database that will allow anyone to learn full sentences quickly by typing text and watching the dynamically generated compilation of the sign language equivalent. Additionally, education and technology have been combined to create tutoring software that learns what you know and steers you to specific lesson components that will fill your learning gaps. These "intelligent tutors" exist for math, accounting, physics, computer science, and other disciplines.

A final set of educational predictions in science fiction is too far out to tell if they are possible. In 1999, a film called *The Matrix* strongly contradicts William Butler Yeats, who said, "Education is not the filling of a pail, but the lighting of a fire" (Yeats, n.d., para. 1). In the film, the characters plug a cable into the back of their heads and go through "programs" that embed knowledge and skills directly into their brains. The lead character, Neo, becomes a martial arts expert in hours instead of years. Another character, Trinity, learns how to pilot a helicopter in seconds. In reality, humans have had little success linking computers to the brain. Recent developments, such as real-time brain control of a computer cursor (Hochber, Serruya, Friehs, Mukand, Saleh, Caplan, Branner, Chen, Penn & Donoghue, 2006), allow us to believe that some day *Matrix*-style education may be possible. By then, hopefully, we will have mastered how to teach higher level thinking skills, since this futuristic just-in-time learning presumably will let us skip over lower level skills.

Imagining technology in education tomorrow

Following Stephenson's example from *The Diamond Age*, we will imagine how emerging technologies from the foreseeable future can help us meet instructional needs in the online environment. Being educators, we will start with the instructional needs when making predictions. To do this, we will focus on needs related to helping students successfully meet the learning objectives: sharing resources, facilitating activities, and conducting assessment strategies.

SHARING RESOURCES

Almost all online instructors begin the teaching and learning process with sharing resources with students. Currently, this process requires instructors to create new and/or find existing resources that relate to the topics being studied and then to disseminate them to the students. Unfortunately, some end the process with just sharing resources instead of going further to facilitate interactivity or to assess student performance. Students may miss opportunities to participate in robust, collaborative learning experiences. Here are some ways in which we think the resource sharing process will change.

User-created content

Learners will not only have the opportunity to add value to structured courses through the use of emerging technologies such as blogs and wikis; many of them will create their own content which can be massaged and developed through group participation. Ordinary people will become creators and producers. Learners will truly begin to take control. Examples can be seen at the website called Wifi Cafés, where Internet users can add the locations of their favourite Internet cafe to an open list, and Current TV, where people—mostly non-professionals—create television segments and shows. Similarly, students, parents, teachers, and others will continue to create and disseminate educational content on a large scale. Instructors will require students to create content to share with their peers.

User-created content provides a challenge, in that it will be difficult to verify the accuracy of each educational resource. Educators often comment that Wikipedia, while very useful, is made by experts and non-experts alike, potentially decreasing its credibility. While research conducted by *Nature* magazine determined that Wikipedia comes close to the *Encyclopedia Britannica* in terms of accuracy of science entries (Giles, 2005), it also shows that collaborative approaches to knowledge sharing require facilitation and editing. No matter what print-based or online source students use to substantiate their course work, they should use multiple sources to check the validity, reliability, and potential bias of information.

To counter this problem, educators will adopt a practice used by eBay and other commercial websites (see the description of similar rating systems in Intelligent Searching above). Namely, people can rate individual pieces of educational content. Users who share educational content will have a dynamic profile that changes each time someone rates their contributions. For example, someone with high ratings would have the title of "trusted content provider". Experts would have an equal opportunity to check the accuracy of user-created content.

The "Long Tail"

In October 2004, Chris Anderson of *Wired* magazine published an article outlining the long tail of business. The term "long tail" refers to a statistical concept of the very low part of a distribution where the population "tails off." The long tail marketing idea is that the Internet is capable of reaching tiny markets, which were previously ignored by marketers because they were too expensive to reach. Online companies can use the Web to sell a vast range of products from mainstream popular items right down to the singularity of one unique unit (Anderson, 2004). Statistically, the sum of the less popular items can outnumber the sum of the popular items.

This "long tail" will also apply to learning. More resources—commercial, instructor- and user-created—are already increasingly available for learners who have, up to now, been somewhat marginalized. English as a second language, international learners, gifted, learning disabled, and physically challenged students, and people with behavioural disorders will all benefit. For example, a website that offers resources for learning disabled students is http://www.npin.org. An excellent site for gifted students is http://www.hoagiesgifted.org.

In general, more user-created educational content becomes available every day. Of course, these user-created resources will draw fewer learners than popular websites like Discovery School or the Exploratorium. However, the accumulated total of learners who use the less popular educational resources—the long tail—will outnumber the learners who visit the popular sites.

FACILITATING INTERACTIVITY

How instructors approach the design of their courses is profoundly affected by their teaching styles (Indiana State University, 2005). The lecture-based approach to teaching is most often used in on-campus courses, and it is what instructors are most familiar with. Findings from research have shown that the lecture-based approach often fails to engage students in online courses (Ally, 2004; Conrad, 2004; Gulati, 2004). Instructors unfamiliar with other instructional strategies need time to explore them while conceptualizing how they will design their online course.

The opportunity to design, develop, and teach in a new medium opens the door to learning new pedagogies. Applying new approaches may affect how instructors perceive their teaching role. In distance education this role shift is often described as a transition from a lecturer to a facilitator (Brown, Myers & Roy, 2003; Collison, Elbaum, Haavind & Tinker, 2000; Conrad, 2004; Maor & Zariski, 2003; Young, Cantrell & Shaw, 2001). This transition is a process that takes time and support, and often it isn't considered when instructors are asked to develop an online course. During the development process, instructors are often surprised at how much is involved in course development and in conceptualizing their role and how they will teach. If the design of the support infrastructure takes this transitional process into consideration, it can positively influence how instructors view their role and, subsequently, how they design their course. This in turn may also affect student success rates in online courses.

As instructors design or redesign their courses to incorporate emerging technologies they may find that their role and that of their students change. In the example of an online course where there is "no there there," a student cannot sit passively at the back of the classroom. To be present and seen in an online class, students must be active and involved. Similarly, an online instructor cannot stand in front of the class and conduct a lecture. Because the online environment differs from a physical classroom, the instructor's role changes as well. For some instructors, shifting from a lecturer to a facilitator role can be a major change in teaching style. Facilitating interactivity in an online course places the instructor alongside the students instead of in front of the classroom.

Designing courses with activities that encourage collaboration, communication, and project-based learning can help instructors step out of the lecturer role. Web 2.0 technologies can be a resource for instructors as they construct new modalities in how they teach and how their students learn. Interactivity can be stimulated by a variety of techniques, ranging from posing questions to be discussed in groups to involving students in projects that include the creation of wikis, blogs, and podcasts.

Forum participation via cell phone

In the future, learners will use cell phones to participate in threaded discussion forums. Instructors and students will use cell phone web browsers to navigate and read threads. Text-to-voice software will read threads to users, giving options such as press 1 to reply, press 2 to hear next message, press 3 to hear previous message, etc. Teachers and learners will use cell phone text message capabilities or voice-to-text software to dictate the thread content. The latter concept requires voice-to-text technology to improve.

For students who prefer it or who don't have a computer, this technology has the potential to provide more flexibility for learning. ClearTXT is a good example of a company that has already started working in this direction. However, voice recognition software still needs to be dramatically improved.

ASSESSING PERFORMANCE

Chapter 14, Assessment and Evaluation, discusses various assessment strategies, so we will focus on how emerging technologies will enable instructors to assess student performance in new, more authentic, ways. As audio, video, and computer applications improve, it will be easier to assess certain knowledge, physical skills, and even attitudes. Virtual reality technologies will also enable students to demonstrate the knowledge, skills, and attitudes to evaluate themselves using methods that they choose (for more, see Chapter 11, Accessibility and Universal Design).

Voice recognition and intelligent tutoring applications

Today, students can record MP3 audio files to demonstrate proficiency in speaking another language. Tomorrow, students will be able to hold conversations with intelligent tutoring programs that use voice recognition software to analyze their phrases before responding, making corrections, or changing levels of difficulty to accommodate their needs. In non-language situations, instructors can use the same combination of applications to assess law student responses in mock court cases or drama student responses during readings.

At other levels, voice recognition and intelligent tutoring will provide multiple avenues for assessing students' true abilities, reducing the overemphasis on standardized, written tests. Primary school students can demonstrate proficiencies such as spelling aloud or reciting poetry, and secondary students, by answering questions about government or literature.

Electronic portfolios

An e-portfolio is a digitized collection of documents and resources that represent an individual's achievements. The user can manage the contents, and usually grant access to appropriate people. Currently, there are a variety of e-portfolio types with varied functionality. E-portfolios are increasingly being used for coursework and other assessment purposes.

While electronic portfolios exist today, very few, if any solutions have reached their full potential. Administrators want a tool that allows them to aggregate student results for accreditation audits and other institutional assessments. Principals, deans, and department chairs want a tool that lets them assess program effectiveness via student work. Namely, they want to see if students can achieve program objectives, and, if not, where the department, college, or school falls short. Instructors, advisors, and counselors want to assess student performance and to guide students through the learning process over time. This could be throughout a four-year period at a university, or during a particular degree program. Finally, students want to be able to bridge to careers by using electronic portfolios to demonstrate their skills, knowledge, and attitudes that pertain to job opportunities.

Emerging technology will enable us to make such a tool, or a collection of tools, and integrate them with other infrastructure pieces that improve workflow. For example, students transferring from a two-year community college to a four-year university can use an electronic portfolio to demonstrate required competencies. By this means a student can avoid taking unnecessary classes, and advisors can help the student plot a course after a quick review of the materials and reflections.

Some of the challenges raised by this idea revolve around the electronic portfolio process, rather than the tool or tools. For instance, organizations may need to clarify what constitutes evidence of competence or even what learning objectives and prerequisites are critical in a particular field. Electronic portfolios may very well inspire changes to long-standing articulation agreements that will not work in the future.

THE LEARNING ENVIRONMENT AND E-LEARNING 2.0

Whether a classroom is on ground or online, for the learning environment to be stimulating, reinforcing, easy to access, relevant, interactive, challenging, participatory, rewarding, and supportive, it should provide input, elicit responses, and offer assessment and feedback. In an online learning environment, these elements are even more critical because learners are working outside of the usual classroom social environment.

The Internet itself has always had the capacity to be a learning medium. Services such as Google and Wikipedia are probably used more frequently as learning tools than any formal courses or learning management systems. Web 2.0 provides new opportunities for learners through participation and creation. In a 2.0 course, instructors will no longer be able to rely simply on presenting material; they will be involved in a mutually stimulating, dynamic learning environment.

E-learning 2.0 is the application of the principles of Web 2.0. Through collaboration and creation, E-learning 2.0 will enable more student-centred, constructivist, social learning with a corresponding increase in the use of blogs, wikis, and other social learning tools.

Rosen (2006) offers a perspective of what a 2.0 course would look like: they "should never be a hodge-podge assembly of old methodologies delivered through new technologies. They should be a true '2.0 course,' rather than a self-propelled PowerPoint presentation or CBT training presented on a PDA. 2.0 courses provide just-in-time training. They are used as a resource—not a one-time event. A 2.0 course lasts 15 to 20 minutes, runs smoothly on any configuration of device (high resolution, portable) or PDA, and delivers smoothly on all versions of web browsers. Finally, 2.0 courses incorporate the best-of-breed techniques from web design and instructional design" (p. 6).

The term e-learning

Distance learning, distributed learning, online learning, e-learning, virtual learning, asynchronous learning, computer supported collaborative learning, web-based learning . . . these are a few of the many terms used to describe learning in environments in which students and instructors are not physically present in the same location. In burgeoning fields, it is commonplace that a variety of terminology is used to describe a new phenomenon. Clark and Mayer (2003) chose the word e-learning and described its functionality:

> [T]he "e" in e-learning refers to the "how"—the course is digitized so it can be stored in electronic form. The "learning" in e-learning refers to the "what"—the course includes content and ways to help people learn it—and the "why"—that the purpose is to help individuals achieve educational goals. (p. 13)

The term e-learning, as well as some of the other terms, will eventually disappear. Electronic delivery will become just one of the options which we will consider to optimize learning for people.

Broadband

What we call broadband today is just a beginning of the kind of network access we will see in the future. Universities are connected by a fibre optic network that works up to 10 gigabits/second. That is 10,000 times faster than the typical broadband download of 1 megabit/second. There will be a next generation of broadband which will enable speeds 10 times greater than we have now and enable downloading of high definition movies and TV shows, **VoIP**, video telephony, full resolution streamed video and audio and the creation of unimagined learning environments.

Learning management

E-learning 2.0 will be a challenge for learning management systems (LMS, also called course management systems). At the time of this writing, most LMS solutions are designed for Web 1.0, with minimal capability for a fully functioning interactive environment. Nevertheless, LMS vendors will gradually incorporate Web 2.0 capabilities. At this time, education LMS solutions are ahead of corporate solutions in this respect. In the immediate future, LMS solutions will continue to be primarily administrative tools and only secondarily real learning tools. Users will be challenged to find ways to use them so that they facilitate learning. For more information on learning management systems, see Chapter 7, Learning Management Systems.

Eventually, we will be able to find almost anything online. Ten years ago, a colleague said that everything current and worthwhile was already online. This is more true now with Project Gutenberg and Google Books putting libraries of books online, universities making their course materials available (e.g., MIT's Open CourseWare), communities creating knowledge repositories with wikis, and blogs making almost everyone's opinions available whether we want them or not.

The challenge will be for learners (all of us) to manage information overload. Much of this will happen beyond the scope of any locally installed learning management system. Google and other search engines will evolve to provide tools for people to manage it all.

Content will be organized as reusable learning objects, much as they are in learning content management systems but on a much broader scale. Wikis and folksonomies may help solve this. Simply put, a folksonomy is a collaborative method of categorizing online information so that it can be easily searched and retrieved. More commonly, it is called tagging. This term is often used in websites where people share content in an open community setting. The categories are created by the people who use the site. To see how tagging operates, go to sites such as Flickr or Del.icio.us. Learning object repositories such as ARIADNE and learning object **referratories** such as MERLOT facilitate the exchange of peer-reviewed learning materials in a more structured way.

Personalization and context-aware devices such as GPS (global positioning system) units will also help. Personalization is the ability of a website to adapt to its users, like Amazon.com does when it suggests other books you may like, or for the user to adapt the website for his or her own purposes like Google does when it allows you to customize what you see on its website. RSS feeds are a way of personalizing information you receive from the Internet. GPS units can locate the user so that information can be customized for that location. For example, a user who lives in Chicago but is visiting New York would receive weather information for New York.

WEBSITES MENTIONED IN THIS SECTION

- Wifi Cafés: http://wifi.earthcode.com
- Current TV: http://www.current.tv
- Discovery School: http://school.discovery.com
- Exploratorium: http://exploratorium.com
- ClearTXT: http://www.cleartxt.com/index.html
- Project Gutenberg: http://www.gutenberg.org/wiki/Main_Page
- Google Books: http://books.google.com
- MIT's Open CourseWare: http://ocw.mit.edu/index.html
- Flickr: http://www.flickr.com
- Del.icio.us: http://del.icio.us
- ARIADNE: http://www.ariadne-eu.org
- MERLOT: http://www.merlot.org

Challenges

There are, however, some barriers to the adoption of these emerging technologies. While learners may embrace them, it may take longer for institutions and corporations to adopt and implement them. Administrative policies as well as an organization's culture can slow down or halt their adoption. Some policy makers may misunderstand the usefulness of these technologies in teaching and learning. As learners adopt new technologies, they will take more control over their own learning, which may challenge the status quo. This may gradually influence corporations and institutions to accept this new paradigm of learning. The consequences of not serving the needs of learners to keep up-to-date with these new ways of learning challenge the relevance of formal training and learning in our organizations.

Perceptions about the quality of certain technology-mediated instructional activities or environments provide additional challenges. As a prime example, the US-based College Board questions "whether Internet-based laboratories are an acceptable substitute for the hands-on culturing of gels and peering through microscopes that have long been essential ingredients of American laboratory science" (Dillon, 2006, para. 3). While emerging technologies allow us to extend nearly unlimited possibilities to those who previously did not have access to them, there may always be a group of people who feel online instruction cannot replace direct experience. Who would not want to see lions and zebras in their natural habitat in Africa instead of going to a zoo or watching a video clip online? Similarly, if it were possible to set up expensive chemistry labs in every school or college, then the virtual environments would not be necessary. They would only serve as a way to refresh knowledge, rather than to obtain it. An alternate solution may be to allow students to learn virtually, but to require them to demonstrate proficiencies in person as appropriate (e.g., before moving to a certain level of difficulty).

Intellectual property (IP) rights and digital rights management will be major challenges. Short-sighted, large corporations who expect to profit from sales (particularly in the entertainment sector) will fight widespread distribution of their product. Solutions like **Creative Commons** licensing will become the new way of doing business. See Chapter 15, Understanding Copyright.

WEBSITES MENTIONED IN THIS SECTION

- Creative Commons: http://creativecommons.org
- Creative Commons Worldwide: http://creativecommons.org/worldwide

Summary

> "Web 2.5, Web 3.0, Web 4.5, Web n: whatever it is, I'm enjoying the ride. The pieces are coming together. Glue, indeed." (Cross, 2006).

Traditional teaching and learning methods and institutions will not go away. They will still be necessary to provide research-based knowledge, structure, and social context for learning. The new technologies will not replace traditional learning but complement it. The history of technology shows us that few technologies replace previous technologies; instead they emerge to coexist and complement them. Television did not kill radio or movies. The Internet has not replaced books. The new technologies discussed in this chapter will be used primarily for extending the ability to create, communicate, and collaborate.

CREATE

With Web 1.0, almost everyone was a consumer. Only technology wizards had the power to create. Now that online technologies have advanced, Web 2.0 enables almost anyone to be a producer as well as a consumer. Pushing this to education, Web 2.0 tools such as blogs and wikis create a level playing field, where faculty, parents, and even students compete with vendors to produce educational content. Going beyond Web 2.0, technology will raise the bar yet again so that everyone can produce educational activities and assessment strategies that incorporate or go beyond the static content.

With this new equality, we face some familiar challenges. Web 1.0 brought us information overload. It still is not easy for everyone to consistently and quickly find the information they seek online. The same holds true for Web 2.0 information, if not more so, since there are so many more information providers. As the quantities of both producers and products grow, quality becomes more difficult to distinguish as well. Instructors today do their students a great service by asking them to consider validity, reliability, and bias of online information. Looking forward to Web 2.5, Web 3.0, and beyond, we will rely on context-sensitive searching, intelligent searching, peer review ratings, and content expert review ratings to separate the digital chaff from the digital wheat. Finding instructional content and activities to meet almost any learning objectives will continue to become easier, but finding quality instruction will take more effort.

COMMUNICATE

In many countries around the world today, communication by cell phones is ubiquitous. Trends in mobile and social computing will make it possible for learners to create and interact with learning communities. For example, using course rosters as "buddy lists" in connection with wireless, mobile devices such as personal digital assistants (PDAs), students will be able to identify if their peers are nearby on campus. Someone in a large section class with more than 100 students will be able to use technology to create a sense of community. The social computing phenomenon will move beyond using static Web pages to share party pictures with peers to using digital storytelling to share competencies with future employers. Instead of smart mobs protesting a political decision, "smart study groups" will form to prepare for quizzes or to provide feedback about written assignments before submitting them for a grade.

Communication challenges in education will include infrastructure, resources, and freedom of speech. Maintaining an adequate communication infrastructure for learning means setting up wireless networks throughout a campus or even throughout a metropolitan area. This work is expensive, labour intensive, and requires a great deal of planning. Educational organizations do not always have the right amount of resources to keep communications running smoothly. Chapter 26, Techno Expression, covers bridging the gap between allowing freedom of expression and setting boundaries to restrict inappropriate behaviour. Despite the power of emerging technologies in education, this balance is difficult to achieve.

COLLABORATE

With both current and emerging technologies, people sometimes collaborate without the intention or knowledge of doing so. Mashups, for instance, require multiple parties to play a role, but only the person who creates the final product really knows what pieces were required to make it work. Even people who make APIs to enable others to use their tools do not know how they will be used. The makers of Google Maps probably did not predict WeatherBonk (http://weatherbonk.com), a popular mashup that lets people view real-time weather on top of a detailed satellite map. Similarly, wikis require contributions from several parties to be successful. The strength of Wikipedia is in the number of people who contribute ideas and who police the site. For evidence of the power of collaboration, note the number of Wikipedia references in this collaboratively written book!

The future of collaboration involves repurposing the emerging technologies to meet educational goals. Instead of weather map mashups with live webcams, we will see underground railroad map mashups with links to writings from former slaves and re-enactments. Students in certain cities can see if their neighbourhood had any homes that participated in aiding slaves get to the Northern states.

Collaboration poses its own challenges. If not facilitated well, it can devolve into anarchy or, at the very least, into the specter of unmet potential. While constructivist theory has become more popular, completely unguided group learning can lead to large groups of people who collaboratively teach each other with misinformation and groupthink. Facilitating educational collaboration requires both structure and flexibility. You can provide structure by defining expectations, writing clear instructions, setting deadlines for each assignment or project component, and being consistent in how you facilitate online collaboration. You can provide flexibility by allowing students to take turns moderating online discussions, giving students choices about which project they pick or which group they join and being willing to move in new directions that emerge during the collaborative exchanges.

Teaching and learning still relies on people—expert learners and beginning learners—more than technology.

Other notable emerging technology sites

- The publisher O'Reilly holds an annual Emerging Technology Conference: http://conferences.oreillynet.com/etech.
- EDUCAUSE: Emerging Technologies and Practices: http://www.educause.edu/EmergingPracticesandLearningTechnologies/5673
- EDUCAUSE: *The 7 Things You Should Know About* series provides concise information about using emerging technologies in education: http://www.educause.edu/7ThingsYouShouldKnowAboutSeries/7495
- NMC Horizon Report and Project Wiki: http://www.nmc.org/horizon/index.shtml
- Gartner's 2006 Emerging Technologies Hype Cycle Highlights Key Technology Themes: http://www.gartner.com/it/page.jsp?id=495475

Glossary

API. Application programming interface. A small software program that enables one computer program or application to exchange data with another.

Asynchronous. Literally, asynchronous is the opposite of synchronous, and means "at different times". In a learning context, this refers to communication that happens when people are not together at the same time as they are in a traditional classroom. Examples include self-directed learning modules, email, and discussion groups. Asynchronicity has the advantage of offering communication at the convenience at the learner, the opportunity to consider responses carefully before sending and the ability to track and revisit discussions.

Augmented reality. A combination of a real environment experienced by the user with virtual elements added by computer input that augment the scene with additional information.

Blog. An abbreviation of web log, a blog is an online journal/commentary with simple automated content-creating facilities, links, and response mechanisms. Blogs often use RSS feeds (see **RSS**) so that readers can subscribe and receive new content as it is published.

CoIP. Communication over Internet protocol that enables enhanced streaming capability for voice (VoIP) and video.

Communities of practice. Groups of people (within organizations or around the world) with similar interests and goals who get together (physically or electronically) to share information about their common interest.

Context-aware environments and devices. Environments and devices that are tuned into the needs and environments of those using them and automatically adjust to the situation are considered to be context-aware.

Creative Commons. A licensing system developed by Lawrence Lessig and others at Stanford University. Creative Commons (CC) licences allow a content creator to decide how published work may be copied, modified, and distributed.

DRM. Digital rights management; the protection of copyrighted digital content to prevent unauthorized viewing, copying or distribution.

E-learning 2.0. The application of the principles of Web 2.0 to learning, specifically the collaboration and creation aspects leading to more student-centred learning.

E-portfolio. An e-portfolio is a digitized collection of documents and resources that represent an individual's achievements. The user can manage the contents and usually grant access to appropriate people. There are currently a variety of different types of e-portfolios with varied functionality. E-portfolios are increasingly being used for coursework and other assessment purposes.

Extended/hybrid/blended learning. A mix of classroom, self-directed, synchronous, and asynchronous approaches designed to optimize the learning for the subject matter and learners.

EPSS. Electronic performance support system. See **performance support**.

Folksonomy. Derived from "folk" + "taxonomy", a folksonomy is a way of categorizing data on the web using tags generated by users. Folksonomies are used on collaborative, social websites for photo sharing, blogs, and social bookmarking. Social bookmarking websites are services that allow users to store their favourite websites online and access them from any Internet-connected computer. Users tag their favourite websites with keywords. These are then shared with other users, and build into folksonomies of the most popular sites arranged under different categories.

GPS. Global positioning system: a satellite-based location technology that can determine position down to a few metres. GPS modules are used for in-car navigation and in handheld navigation devices and can be added to PDAs and laptops. Location-based services that make use of the technology are being developed for education.

Learning management system (LMS). Computer software designed to manage the organization, delivery, and tracking of online courses and learner performance. They are sometimes called virtual learning environments (VLE) or course management systems (CMS). Corporate learning management systems are also designed to manage classroom instruction.

Learning content management systems (LCMS). Content management systems specifically designed for managing learning materials. Typically, they include a searchable learning object repository or database.

Learning objects. Small chunks of information (text, graphics, modules, video, audio, etc.) that can be used for learning. Usually discussed in the context of reusable learning objects and learning content management, which refers to the storing and cataloguing of learning objects so that learners and instructional designers can access, reuse, and adapt them.

M-learning. Mobile learning: learning delivered through mobile devices such as wireless laptops, cell phones, PDAs, etc.

Mashups. "A mashup is a website or web application that seamlessly combines content from more than one source into an integrated experience" (Wikipedia, 2006a, para. 1).

Massively multiplayer online game (MMOG). An online game that can be played simultaneously by many people.

MMS. Multimedia messaging service (MMS) is a technical standard to provide for the addition of rich media (audio, video, etc.) to text messaging.

Moblogs. Blogs posted to the Internet from mobile devices such as PDAs and cell phones.

Peer-to-peer sharing. In a peer-to-peer (P2P) network, files are shared directly between computers without going through a server.

Performance support. Performance support refers to providing information to working people when they need it in order to do their jobs effectively. This is sometimes referred to as just-in-time training. Tools may include job aids and electronic performance support systems (EPSS) that enable people to access relevant information online.

Podcast. Podcasts are audio files that can be easily distributed via the Web and downloaded to computers and personal audio players. Podcasts are often syndicated (via RSS) so that users can subscribe (usually for free) to a particular service and download new content automatically. The software required is available for free or at little cost, making this form of broadcasting extremely accessible.

Referratories. Referratories link to other sites for information and content, as opposed to a repository, which contains the actual content.

RFID. Radio frequency identification: a generic term that refers to wireless technologies that are used to provide information about a person or object. The term has been popularized with the emergence of RFID tags: inexpensive, miniature wireless chips with antennae that can be embedded into objects. It is used mainly in the distribution and inventory business for tracking the location of shipments and parts.

RSS. Really simple syndication: a set of XML-based specifications for syndicating news and other website content and making it machine-readable. Users who subscribe to RSS-enabled websites can have new content automatically 'pushed' to them. This content is usually collected by RSS-aware applications called aggregators or newsreaders. Some Web browsers now have these newsreaders built in.

Simulations. Simulations in e-learning are attempts to create a level of reality in a computer environment so that learners can practise skills, solve problems, operate expensive machinery, or conduct interactions in a safe situation.

Smart mobs. A smart mob is an electronically interconnected group that behaves intelligently or efficiently because of its exponentially increasing network links. This network enables people to connect to information and other people, allowing a form of social coordination (Wikipedia, 2006b, para. 3).

SMS. Short messaging service (SMS) is a technical standard that provides the capability for text messaging via cell phones.

Swarmcasting. "Swarmcasting enables web content, especially rich media (video) files, to be sent across the Internet more efficiently than traditional routes. The content or original file is broken into much smaller packets, which are then distributed to any computers that have requested them" (Stead, Sharpe, Anderson, Cych & Philpott, 2006, p. 38).

Synchronous. Literally, synchronous means "at the same time." In a learning context this refers to events that occur with all participants present, such as classrooms, chat sessions, and web conferencing. It is the opposite of **asynchronous**.

Social computing. Social networking software is "a category of Internet applications to help connect friends, business partners, or other individuals together" (Wikipedia, 2006c, para. 4).

Virtual classrooms. The use of web conferencing or online meeting applications to conduct classes over the Internet.

Vlog. A blog based on video content.

Vodcast. Video podcasts broadcast video over the Internet.

VoIP. Voice over Internet protocol (IP) is a technology that breaks voice communications into packets that can be sent over IP networks such as local area networks (LANs) or the Internet. This has advantages in terms of cost savings and increased functionality and manageability.

Web 2.0. "Web 2.0 refers to an emerging network-centric platform to support distributed, collaborative and cumulative creation by its users" (Hagel, 2005, para. 6). It is about using the World Wide Web to create, as well as access content through social computing tools.

Webcam. A webcam is a live video camera that is either integrated into the hardware of a computer, is a separate piece of hardware that attaches to a computer, or stands to the side of a computer. Webcams are used for synchronous online meetings and videoconferencing. Other uses involve displaying real-time weather and traffic.

Web conferencing. Software applications that enable meetings over the Internet. They add presentation, visual, audio, and group interaction tools to chat functions.

Wiki. Collaborative Web pages that can be viewed and modified by anyone with a Web browser and Internet access.

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2
Virtual Design Studios: Solving Learning Problems in Developing Countries

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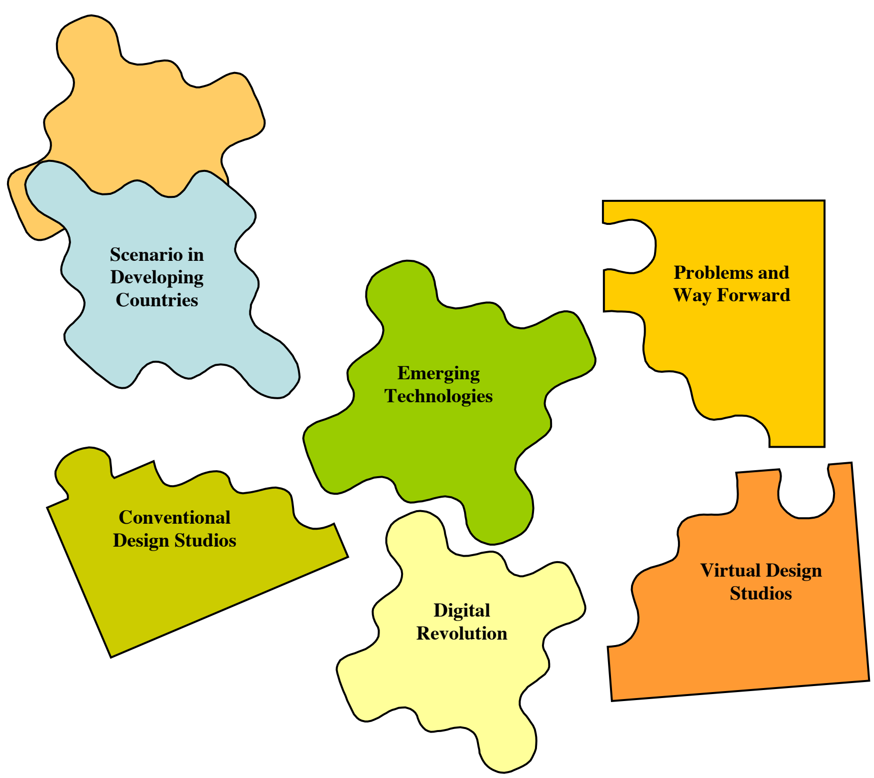

Learning outcomes

After completing this chapter, you should be able to:

- Describe the onset of the digital revolution by emerging technologies.
- Argue the need for design studios in design studies.
- List the benefits and limitations of conventional studios.
- Describe additional advantages offered by virtual studios.
- Detail the steps by which potential users would post their designs and developments, and communicate with their supervisors and other designers across the globe.

Introduction

The onset of digital outreach with emerging technologies in developing countries is akin to the industrial revolution in Europe. In the scenario of education, the revolution led to the emergence of distance learning universities, some of which have since become among the top education providers. Their emergence in the Western world was followed by more open universities in Hong Kong, India, Australia, Sri Lanka, and other countries. Digital revolution is more than a buzz phrase; it is bringing the previously neglected continent of Africa into the sphere of higher education. It is expected to bridge the digital gap by employing better and cheaper means as "weapons of mass communication" (Tapscott and Williams, 2008), such as e-learning, videoconferencing, podcasting, and virtual studios, etc.

A special area of learning is how to design and display their progress of designing and development in a studio. Design studios are expensive to build and most African and Asian universities cannot afford them although they have courses of study on industrial design, interior design, textiles and leather design, and so on. This chapter dwells on the creation of virtual design studios and demonstrates how virtual design studios may replace conventional studios because they provide an extended connectivity, in addition to enabling the functions of a conventional studio. In doing so, Afro-Asian universities may collaborate among themselves, as well as with the advanced countries in the world. It may also enable them to pursue collaborative design projects and enhance export potential, both of which are so important for the developing countries to bring about two-way globalization. The fact that e-learning can deliver more training to more people at more places in less time and at less cost with less supervision makes it worthwhile to explore the possibility of e-designing.

It is unfortunate that Africa has had the least per capita enrollment in tertiary education. A study reported by UNESCO Global Education Digest (2006) puts it at 3.5 percent, stating it as 1.9 million against a world figure of 81.7 million enrollments. It is also noted that scientific articles worldwide rose by 40 percent whereas the same fell by 12 percent in Africa during the period 1988 to 2001 (Adekanmbi, 2007). However, the UNESCO Institute for Statistics (2006) observed that African students are the most mobile in the world, mainly in search of better educational facilities, with one out of every 16 students studying abroad.

Digital divide estimates reported by International Telecommunications Union (2007) show that during the ten-year period, 1994 to 2004, some figures in developing countries (with 83 percent population) compared to those in advanced countries (with 17 percent population) are as follows:

	Developing Countries	**Advanced Countries**
Internet users/100 inhabitants	Increased from 0.03 to 6.7	From 2.18 to 53.8
Mobile telephone users/100 inhabitants	Increased from 0.19 to 18.8	From 5.2 to 76.8

It reveals the fact that the digital gap continues to widen, despite newer initiatives and emerging technologies. Whether or not the digital divide can now be arrested with the latest technologies and innovative use of the same is, therefore, an open question. An attempt is made to project the optimism in the developing world.

The scenario in developing countries

It is necessary to understand the scenario in Afro-Asian countries. Although they differ appreciably in their policies and plans most of them are committed to improving the life and education of people by legislating several different national documents. Almost all national institutions have formulated vision, mission, and values statements. For example, in Botswana, there is the long-term vision document *Vision 2016: Prosperity for All (1997)*, which is being implemented and monitored in a phased manner. Alongside it are the *National Education Policy, National ICT Policy and University Policies on Shaping the Future*, as well as a Computer-aided Learning, Digital Outreach Policy, etc. At the time of writing, the *Botswana National Development Plan 10* is being created, and the University is including digital learning and outreach. The University's Vision and Mission statements are available in the Annual Calendar (2007).

Likewise, policy documents committing themselves to higher education and national development exist in almost all African and Asian countries. Some are, however, short of ground realities, mainly due to lack of financial resources. In Africa, design courses are offered at several universities in South Africa, Botswana, Zimbabwe, Nigeria, Tanzania, Kenya, and elsewhere. All design courses require actual or virtual design environments. It is, therefore, important that all of them be aware about evolving technologies and their relevance to their own developmental priorities.

There are some networks in Africa which become active every now and then. For example, the Southern African Regional Universities Association (SARUA, 2005) is an association for the 63 publicly funded universities located in the Southern African Development Community (SADC). SARUA aims are to:

- promote, strengthen, and increase higher education, training and research through expanded inter-institutional collaboration and capacity building initiatives across the region;
- promote universities as major contributors towards national and regional socio-economic development.

Another well-established network is the African University Network (AFUNET), also known as the Global Virtual University (GVU, 2000), which was created as a practical response to the World Summit on the Information Society (WSIS) Plan of Action. It is designed to enhance the capabilities of African universities to take advantage of the opportunities associated with the emergence of global information society, akin to the National Science Foundation in the US. Despite challenges of operation, it holds promise to integrate the African continent into the global information society and economy. The AFUNET project is currently handled by the Association of African Universities (AAU), which has also set up a parallel Research and Networking Unit.

Developing countries are also catching up with the emerging pedagogical paradigms. In this aspect, students appear to be ahead of teachers! One may summarize the paradigms from the students' perspective (Thomas, 2007) as follows:

Students wish to:

- maximize their learning by interaction and communication with others than by reading alone. They appear to use all available resources, particularly the Internet by click-click and 'thinking together'.
- become more active, flexible and ubiquitous in their sociological environment.
- construct new knowledge by engaging in learning on their own.

It appears that the new type of learner expecting the learning context to be interactive, collaborative, and socially exciting, looking for learning materials in flexible format is already born. This paradigm shift is conducive to the spread of virtual learning. Once facilities are made available, students are keen to engage themselves, even by working beyond their normal timetable.

The University of Botswana, with an enrollment of 15,000, provides a good example of the students' willingness for e-learning. Though WebCT was launched in 2002 with only 21 online courses, it did so with considerable drive by the Centre for Academic Development. Students began to ask for more online courses, thus urging lecturers to work, resulting in 450 courses on WebCT/Blackboard format in 2007. The university is also moving towards online journals, digital repositories, and virtual sites in the wake of the digital revolution. In doing so, academics are keeping abreast of the latest developments in their fields by accessing information, writing articles and publishing papers online.

CONVENTIONAL STUDIO ENVIRONMENT

Design practice is a very important component of all design-related programs, and one or more design studios should be provided for this purpose. Every student needs to be allocated a seat in a studio, where he or she may work any time of the working day.

Figure 2.1 A typical design studio in an institution

Figure 2.2 A bamboo design studio at IIT Mumbai

A design studio in an institution, as shown in Figure 2.1 and a special materials (bamboo) design studio shown in Figure 2.2 are large enough spaces to accommodate 20 to 30 students with provisions for the following:

- sketching, drawing, writing, modelling, etc.
- pin-up boards, display stands, whiteboards, and easels with charts, etc.
- free movement to comment and critique by fellow students, staff, and visitors in an informal environment individually or in small groups.

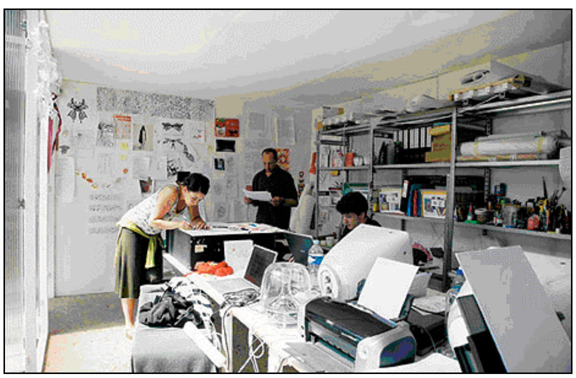

Figure 2.3 Boontje Design Studio France

Figure 2.4 Acura Vehicle Design Studio

Design studios in industry, Figures 2.3 and 2.4, may look a bit different, that is, with just one or two designs being studied in great detail from several different points of view, such as shape, form, aerodynamic profiling, general appeal, ergonomic suitability, turning wheel, braking system of a new motor car.

It costs a great deal of money to get space and infrastructure to make a good studio. And then, there is always a risk of loss and vandalism of expensive items. Moreover, it cannot be open all day and night and one has to come to the studio to do anything; one may be living several kilometres away so that by the time one arrives, some ideas may have already evaporated or gone with the wind! Therefore, with all the advantages of a real studio, there are associated problems and limitations, including the following:

- fixed place and limited time for access to the studio
- safety and security problems from within and without!
- requires more funds for updating every time
- no provision for distance and open learning
- no scope to expand for larger number of students
- no interaction with students elsewhere, i.e., outside the institution and
- no access to/by design professionals except by special invitation.

VIRTUAL DESIGN STUDIO ENVIRONMENT

The concept of a virtual studio is not new, and some studies have been reported by authors (Wojtowicz, 1995, Al-Qawasmi, 2005, and Chen et al. 1994). The latest studies, however, reveal that there have been a number of limitations which must be overcome (Mather, Simoff & Cicognani, 2006). The infrastructure of a virtual studio should not only match but also outsmart the infrastructure of a real-life studio in terms of the following:

- provision for sketching, drawing, printing and computer modelling, etc.
- virtual pin-up boards, displays, writing surfaces, space for models and exhibits in a pleasing environment and
- free access to comment and critique by fellow students, staff and visitors whenever and wherever they like!

One such virtual studio created at the university Web link (Kumar, 2007) is shown in Figure 2.5, with garden-like entry and similar interiors with five different designs posted in it; one of them is shown in Figure 2.6.

Figure 2.5 A general view at the entrance of a virtual design studio

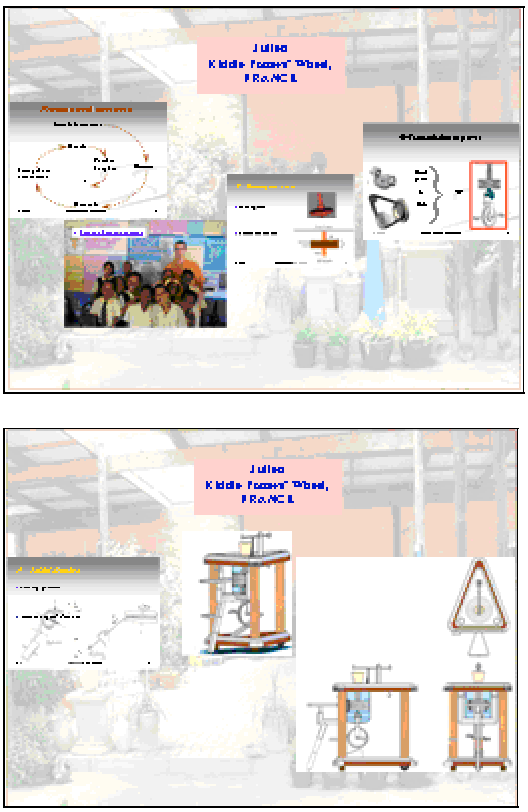

Figure 2.6 Design details contributed by Julien on the Potters' Wheel from France

Virtual studios are likely to be more flexible than real-life studios by permitting the following:

- any place and any time; 24/7 access
- completely safe and secure, since there no removable items
- not requiring any more funds for updating and for larger number of designers
- allowing interaction with students located anywhere across the globe and
- permitting free access to/by design professionals by shared login and passwords

A number of telephone systems are becoming available which can be used to interact instantly between the designers. Web phone and cell phones can be used to advantage. A recent leap forward with Skype offering free-of-cost one to one or a group telephone conferencing opens up a new possibility. A number of staff members in Africa are already employing it to converse with counterparts in other design institutions. A recent Skype advertisement proposes free business conference calls, and goes as follows:

> Talk to more people at once: Conference call the easy way. Start a ten-person call or invite others into a call you are already having. Perfect for business and when you need to chat to a few friends at once. *Catch up on the latest news!*

The new arrival, Iphone, advertised as "breaking the mould", is indeed a welcome addition in Africa and Asia as elsewhere. Likewise, the onset of podcasting is being felt through the Internet, both on PCs and Macs. Examples of real dialogues are as follows:

Interaction with Julien in France

Professor: Bonjour Julien, Are you there?

Julien: Oui, Prof, I am here! You like my new design of the kiddies' potter's wheel?

Professor: Ya, but does it suit the kids' anthropometrics and likes/dislikes?

Julien: But then, I must decide the type of design and then select a group of kids (8–12 years) to measure their dimensions and the pulling force to find if they can pull-start the wheel or I shall have to use a battery just like starting a car!

Interaction with Sepopo in Botswana

Professor: Dumelang Sepopo, can I see your progress on the coin sorter?

Sepopo: Yes, Prof (showing three models) I have to decide which of these is the best to go ahead!

Professor: Don't you think that the spiral slope design would take less space compared to the linear slope design?

Sepopo: So, that's the best one because the third design appears so complicated to me.

Interaction with the Professor from Netherlands

Jan: Morning Prof! I see you online! Look at this "special" coffin design!

Professor: Ehe, Jan, can it be assembled quickly before selling?

Jan: Ya, that's the idea! Over 100 sheets can be transported by a pick-up van, stored in a small space and assembled one only when ordered by the customer!

Professor: Impressive! This design has a great business potential! You can become an entrepreneur!

Jan: No Prof, you know, it is an industry sponsored project; I am paid to design it!

Podcasting is becoming increasingly popular in Africa and Asia as in the rest of the world (Wikipedia, 2008). Podcasts, collections of digital media distributed over the Internet, often employ syndication feeds, for playback on portable media players, e.g., iPod, MP3 player, and PCs. Several thousand podcast episodes can be stored in iTunes stores and retrieved at will, enabling us to use them in teaching, learning, demonstration, etc. Requirement of podcasting equipment, mechanism of podcasting, and practical examples are available at various websites, e.g., Podcasting Tools (2008).

INTERACTION THROUGH VIDEOCONFERENCING

Desktop web camera installed on computers and adequate bandwidth made available, it is easy to confer with one another in vision in real time, as shown in Figure 2.7.

It is quite possible today that a professor, carrying a laptop equipped with web camera and two-way audio, can interact with design students via videoconferencing while traveling abroad, simply by plugging the USB cable into the Internet socket in the hotel room. For example, I would still be able to log on to the UB Web link and interact with my design student Mr. Nyati in Botswana as follows:

Prof: Dumelang Nyati! Can you hear me?

Nyati: Yes, Prof (showing the model) I can hear you and see you. U look sleepy!

Prof: It is the time difference; I just woke up to talk to you while you are awake! The model looks good! What diameter, weight and speed of the rotating wheel?

Nyati: Not yet, I have to work it out by way of an experiment. Ask me tomorrow, when you wake up, Prof!

Several open schools and universities across the world are committed to employing videoconferencing. For example, Roger Edmonds from the Open Access College (Edmonds, 1994), using Tryst compressed video system, stated:

> We are managing a project trial of desktop compressed video conferencing to deliver its curriculum of distance education to school based students.

Their early indications of its immense capability to offer enhanced learning opportunities, enabling more group work and social interaction between students, have taken place over the years.

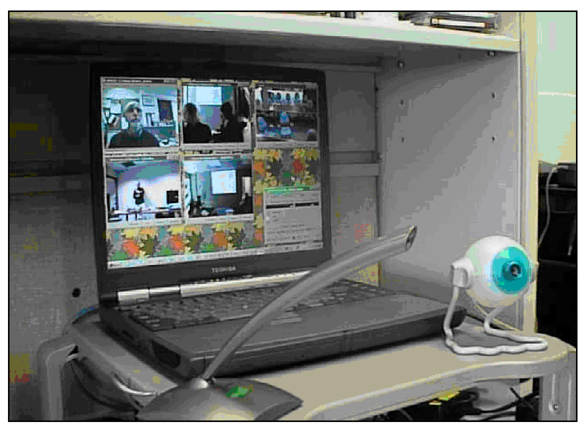

Figure 2.7 Examples of Desktop Videoconferencing

Problems and the way forward

Despite the information technology boom, several universities in developing countries are not taking advantage. Some of the documented problems and proposed solutions are as follows:

Some Problems[a] in Developing Countries	Proposed Way Forward
Inadequate financial resources	Finances should be created by careful budgeting and by seeking funds through collaborative projects with advanced countries.
There is not enough digital support for academics	Yes, but we are the ones to generate resources, as above!
Depth of IT skills a limiting factor	True; academics should attend short courses and/or learn the same from the websites.
Lack of time and workload problems	These are universal problems; we should be active 24/7 to overcome this problem.
We don't know what we don't know	If we realize this fact, we have no excuse to relax. Let us conduct awareness sessions for staff members.
Students don't take it seriously	This is not true; students are ahead of the lecturers in IT skills and in their desire to work seriously and long hours.
Lack of knowledge about infrastructure and support	Computers with multimedia software, sound, video, graphics, and storage of several GB, double, etc. are required.
Vandalism and loss of expensive equipment from laboratories	Better security arrangements, vigilance and stakeholders' cooperation.

[a] Ayitayo, 2007; Kabonoki, 2007

PROPOSED EFFECTIVENESS STUDY

It is proposed to undertake a comprehensive effectiveness study in order to establish whether or not a virtual studio is as good, worse, or better than a real-life studio. Such studies are indeed necessary in the advanced countries, which are going full stream with the new technologies. An effectiveness study, similar to the one conducted by the author (Kumar, 1999 and 2000), is proposed to be conducted in Afro-Asia as to whether virtual design studios are making any difference. The techniques of the control group vs. experimental group, together with observational studies, will be employed. It is intended that a null hypothesis that "a virtual studio is no better than a conventional studio" would be the starting point so that all the pros and cons of both come into play. Instruments of data collection will be based on the following:

- observing students' assignments
- conducting pre- and post-tests
- analysing responses to a questionnaire
- conducting interviews of students
- comparing students' portfolios and reports
- asking staff for their reflections
- soliciting peer opinions and assessment.

MANAGEMENT OF VIRTUAL STUDIOS

While virtual studios offer enormous possibilities, there are still some challenges which must be met with before implementation. The challenges include understanding and appreciation of the senior bureaucrats and technocrats like Directors of Information Technology on the one hand and Director of Research on the other. These are the management problems to be solved. While the former needs to establish a link with enhanced bandwidth and capacity, the latter may permit a special grant to conduct a comprehensive effectiveness study.

Construction of a virtual studio poses a special challenge because one has to use several different softwares to make an interactive site, where several designers can access and contribute to one another. Dreamweaver and Macromedia Flash, together with Freehand appear to be leading us to explore further with AutoCAD 200 Plus and Adobe Photoshop. We are also exploring the use of 3D Max versions 4 and 5. One has also to settle for a different pedagogical paradigm which requires a change of mindset. A studio experiment (Al-Qawasmi, 2005, p. 205) was helpful in understanding the success in operating their computer-aided architectural designs studio and ARC 225 virtual reality in architecture.

Parallel models are being conceived to launch product designs from multiple locations with maximum permissible flexibility. Clearly, such a range of expertise is beyond a single individual in any one area, whether education, information technology, engineering, or design. It is, therefore, essential to constitute multidisciplinary teams under a well-conceived project to be funded by the universities wishing to get involved. I must add that the University of Botswana and the African Network of Open Universities have shown positive interest in the project, and they are in the process of identifying partners in Europe and other countries. Interested staff members should seek research grants in order to procure the items necessary for carrying out the experimentation and further study.

Acknowledgments

The author wishes to thank his colleague Botumile Mataka, who assisted in developing the website and all the five design students who agreed to upload their designs for the experimentation.

Acknowledgments are due to the authors of the following websites from where illustrative images were captured through Google search:

- http://images.jupiterimages.com/common/detail/21/07/22620721.jpg
- http://mocoloco.com/tord_boontje_studio_france.jpg
- http://www.idc.iitb.ac.in/about/images/bamboo-studio-1.jpg
- http://www.ridestory.com/files/acura_design_studio1.jpg
- http://www.ceo.wa.edu.au/home/carey.peter/vc.jpg
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3

Challenges Confronted and Lessons (Un)Learned: Linking Students from the University of Ghana and Kwantlen University College

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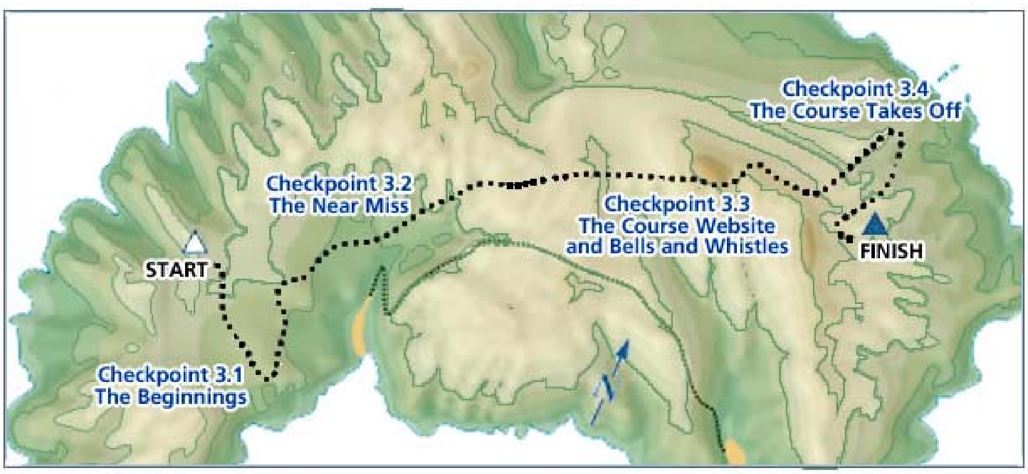
… for the cultures of the "Global Village" to flourish in a tolerant, mutually beneficial fashion, it is imperative that here be real sharing of ideas, knowledge, and values. – Charles Quist-Adade (2008)



Learning outcomes

After completing this chapter, you should be able to:

- Understand the steps and processes in setting up a partially online and webconferencing course.
- Know the challenges and difficulties in setting a webconferencing course.
- Be aware of the technologies needed in setting up a webconferencing course.

Abstract

… the course was conceived on the basis of two ideas—"Classroom without Walls" and "Global Village". – Charles Quist-Adade (2008)

This chapter presents preliminary overview and findings of a pilot course webconferencing course on Globalization involving largely students and instructors in Canada and Ghana.[3] The overview will focus more on the planning and implementation stages of the course than on the delivery and content. It will highlight the challenges confronted, lessons learned, and lessons unlearned throughout the more than two years planning and implementation of the project, whose principal objective was to create geographically distributed collaborative learning and teaching between students and faculty in developed and developing countries.

The undergraduate and graduate course on Globalization (Sociology of Global Inequalities), which was implemented in the Spring of 2008 (from January 7 to April 21), was conceived on the basis of two ideas—"Classroom without Walls" and "Global Village". It was designed, using a unique interactive multimedia approach to link students and faculty in two international locations—Ghana and Canada. The course, through the integrative information and educational technologies, aimed to break the boundaries of time, space, and distance thereby facilitating the sharing of knowledge between the students at the three sites. What is more, it sought to create a "networked collaborative learning environment" for students and instructors at the University of Ghana and Kwantlen University College in British Columbia, Canada.

The partially online course used a mixed mode delivery approach, combining synchronous video-audio streaming (videoconferencing), real chat, online materials, pre-packaged online materials, as well as asynchronous chat sessions. The course had a classroom component at each of the host sites that was supported by a course website. Interaction between learner and lecturer was primarily through text messaging and online chats during synchronous lecture sessions. Students also had to use online chat sessions and discussion forums with teaching assistants.

The course had a mix of synchronous and asynchronous activities (i.e., some activities took place at the same time, same place; some at the same time, different place; and some at a different time, different place). The course provided continuous feedback, high levels of interaction and an emphasis on student work and group projects.

In all 31 undergraduate students from Kwantlen University College (KUC) and six graduate students from the University of Ghana, Legon (UGL) took the course. The preliminary study showed that while the preparatory stage was quite daunting and the project leader had some harrowing experiences in finding collaborators, accessing funding, the overall benefits of the project to both students and instructors were quite substantial, making the efforts and sacrifices worthwhile.

Introduction

"While Canadian Communications scholar Marshall McLuhan put us all in a 'Global Village', the benefits of the village appear to elude a sizeable number of the villagers as the digital divide between the technology-haves and technology-have-nots has been growing ever wider and wider". – Charles Quist-Adade (2008)

While Canadian Communications scholar Marshall McLuhan put us all in a "Global Village", the benefits of the village appear to elude a sizeable number of the villagers as the digital divide between the technology-haves and technology-have-nots has been growing ever wider and wider. Knowledge and ideas flow in a unidirectional, North-to-South (from the Developed World to the Developing World) fashion with little going in the opposite direction. A lopsided flow of knowledge, values, and ideas creates an atmosphere of mutual suspicion and recrimination, with some of the villagers complaining of "cultural imperialism" and others fending off such charges by saying they are only promoting the ideas of "democracy". But for the cultures of the "Global Village" to flourish in a tolerant, mutually beneficial fashion, it is imperative that there be real sharing of ideas, knowledge, and values.

[3] It must be said here that one Canadian student took the course from India, where she is currently based.

Globalization has been described as an ideology and practice of corporate expansion across borders and a structure of cross-border facilities and economic linkages, which focus on the imperialistic ambitions of nations, corporations, organizations … and their desire to impose themselves on various geographic areas (Ritzer, 2003). While this description may sound cynical, and points to the vulnerabilities of the concept, it is imperative to extend and expand the intellectual realm of Globalization on the crest wave of the ever-evolving information revolution to the benefit of students and countries worldwide.

There is no better forum to address the ever-increasing need for mutual understanding and mutual respect across cultures and national borders than via collaborative learning.

Formal education systems, in the developing world in general and Africa in particular, are taxed by minimal resources and extensive responsibilities. A "conspiracy" of factors—limited financial resources, the brain drain which has affected tertiary institutions the most, the dearth of information communication technological (ICT) facilities, among many others—makes clear the need for new and alternative approaches. While the use of ICT may increase the likelihood of improved learning only so much, its capacity to alter the status quo is unparalleled. "Using technology to attract and facilitate connections and interaction among communities, regardless of where they are located or who they are, can promote flows of information and knowledge, creation of ideas and initiatives, and ultimately a healthier society" (African Universities Initiative, 2005).

This project will offer Canada a fine opportunity to play its part in bridging the digital gap between a developing country and a developed one, while facilitating mutual enrichment of the life experiences of Canadian and Ghanaian students, improving and innovating pedagogical methods of educators in Canada and Ghana.

The course will be guided by the more benign conceptualization of globalization as "the worldwide nexus of practices, expansion of relations across continents, organization of social life on a global scale, and growth of a shared global consciousness" (Lechner, 2003, p. 72). It will be a cost-effective and innovative way to exchange knowledge across continents, allowing for the "interpenetration of the global and the local," which will bring about unique outcomes in different geographic areas (Ritzer, 2003, p. 73) As a micro academia in the global academic world, it will offer the best opportunity for both students and faculty to contribute to the global "stock of knowledge" through an active cross-fertilization of cross-cultural ideas.

Already, increasing numbers of institutions of higher learning and non-profit organizations in collaboration with ICT companies have developed free resusable online resources which allow for the sharing of academic knowledge, pedagogical practices, course resources not only between institutions, but also between students and educators in different countries. The Massachusetts Institute of Technology (MIT) has perhaps one of the leading global collaborative learning projects. MIT's Open Courseware (OCW) provides free, searchable access to MIT's course materials for educators, students, and self-learners around the world. The Singapore-MIT (SMA) is a classic example of how collaborative learning and teaching can revolutionize the global exchange of knowledge and help train innovative leaders of the world. In the words of Professor Schmalensee, SMA "joins students at the National University of Singapore, Nanyang Technological University, and MIT in a virtual classroom taught—via Internet2—by professors from all three universities. SMA was founded in 1998 to promote global engineering education and research while providing students with unlimited access to exceptional faculty expertise and superior research facilities. While students may sit in classrooms at different sites, they share course lectures, online materials, and research opportunities with over 90 faculty—half from MIT." MIT has expanded its project to include Korea and Mexico and it's now eyeing Africa, precisely Ghana (http://alumweb.mit.edu/opendoor/200011/degree.shtml).

In Canada, BCcampus has developed a leading edge technology that allows the free searchable access to courses across the Province. Through BCcampus, students, educators and self-learners can access services, resources, and online courses from several participating institutions. In addition, users have access to the Online Learner Community, an online community that provides users opportunities "for collaboration, general interest, and special event use". Through its SOL*R, BC public post-secondary educators can license, contribute, and access free online learning resources. As a repository portal, SOL*R facilitates the sharing, discovery, reuse, and remixing of course material—including course outlines, lecture notes, best teaching practices, etc. from a wide variety of disciplines and subject areas.

Connexions

Connexions is an environment for collaboratively developing, freely sharing, and rapidly publishing scholarly content on the Web. Its Content Commons contains educational materials for a variety of users, including children to college students to professionals, which is organized in small modules that are easily connected into larger courses. All content is free to use and reuse under what it calls "Creative Commons attributable" licence. Connexions' philosophy is "Sharing is good". Guided by this philosophical principle and informed by the logic that people need not re-invent the wheel, the creators of Connexions have made it possible for people to share their knowledge, so "they can select from the best ideas to create the most effective learning materials".

Carnegie Mellon

Another online learning project with a huge potential for shared global learning and instruction is the Carnegie Mellon Online Learning Initiative (OLI) project. The project which grew out of collaboration among cognitive scientists, experts in human computer interaction and seasoned faculty aims to increase access to education, "enhancing the quality of instruction and providing a model for a new generation of online courses and course materials that teach more effectively and appeal to students more powerfully than anything in existence today". The project is unique in that it adds to online education the crucial elements of instructional design grounded in cognitive theory, formative evaluation for students and faculty, and iterative course improvement based on empirical evidence. OLI courses include a number of innovative online instructional components such as: cognitive tutors, virtual laboratories, group experiments, and simulations.

Open University

The United Kingdom's Open University is one of leaders in the field of online learning. In fact, OU is the pioneer in the field, having been making learning materials freely available as early as 1969 through its partnership with the British Broadcasting Corporation. The OU's OpenLearn was launched in 2006 to open access to education for all and it is designed for distance and elearning. It now boasts of 700,000 users globally. It incorporates videoconferencing technology, FlashMeeting for seminars and collaboration, Compendium (knowledge maps), MSG (instant messaging), as well as self-assessment tools.

Open source software and operating systems in Africa

According to a recent survey of ICT and education in Africa commissioned by the World Bank, there is a growing interest in free open source software (FLOSS) in Africa. The Free and Open Source Software Foundation for Africa (FOSSFA), Bokjang Bokjef in Senegal, and LinuxChix Africa are examples of organizations promoting the use and development of FLOSS in Africa. At the same time, the report noted substantial drawbacks with regard to the dearth of skilled personnel available to support such systems.

As a recent Elluminate report **The Impact of Synchronous Online Learning in Academic Institutions** … noted that distance learning can be an isolating experience. Consequently, transitioning from simply delivering courses to providing a total experience is a central to distance learning. Creating online communities will help foster a sense of connectedness. The report also notes hat increasing numbers of institutions of higher learning and governments have concluded that "it's time for academia to blend pedagogical structure with sound business decision-making. It's also time to change mindsets and approaches to move online education from current trend into the mainstream". This explains why all over Canada and the rest of the world, institutions of higher learning are introducing elearning as a supplement or a complement to traditional teaching modes.

Course description and objectives

The course examined different types of inequality and the historical, as well as contemporary roots of these inequalities throughout the world. It focused on the relationship between globalization, inequality, and poverty; the fate of cultural diversity in a globalizing world; and issues of gender, ethnicity, the environment, social justice, and human rights. It also discussed several development patterns and trends that influence peoples of various countries in the global system from a comparative and cross-cultural perspective. Different regions of the world, including Africa, Asia, Europe, and the Americas were examined from both a substantive and theoretical perspective.

The course was based on the premise that globalization is dialectical process with local and global interests colliding, coalescing, negotiating, and negating each other. In other words, globalization was perceived as the master trend reshaping social life everywhere, while social outcomes were shaped through interaction with other processes as well. The course was interdisciplinary, combining perspectives from sociology, anthropology, political science, economics, and philosophy to explore the meanings of globalization and its central processes and institutional structures.

The course sought to develop a conceptually grounded understanding of the various aspects of globalization, particularly, economic, political, social, and cultural. The main objectives were to introduce students to: (a) the main topics and debates related to globalization; (b) the conceptual and empirical tools available to frame discussions of globalization topics; and (c) the multifaceted ways in which globalization manifests itself and its complex impacts on individuals and collectives and multiple ways individuals and collectives are challenging and shaping globalization in the contemporary world.

The beginnings

The course was conceived in the Fall of 1998 when I was a lecturer at Wayne State University. I received a School of Liberal Arts' innovative Global Curriculum research grant. The aim of the grant was to encourage faculty to design courses with an eye to linking students and faculty of Wayne State with students and faculty in different parts of the world. With a modest seed grant I began an intensive research into long distance learning. Also, began to look for collaborators in Ghana, South Africa, and Kenya. I continued my research when I moved to Central Michigan University in the Fall of 2003.

Looking for collaborators was quite daunting. After several "blind" emails and phone calls I was able to get in touch with a couple interested ones but lost contact with them somewhere along the line. Many of those who I maintained more or less longer links with preferred the traditional methods and eventually lost interest in my proposal. Their greatest fear, I gathered, was change. They appeared comfortable with "what they have," i.e., the hassle-free traditional mode of pedagogy. Many of these referred me to colleagues who they suggested might be interested. These in turn suggested others who might be. Two constant questions I was asked were "How is the technology going to work?" "We do not have even one computer in our entire department, how are we going to train our students to take a course that is computer-based?" The electronic aspect was quite intimidating to most of them, even to me at first. Just thinking about how to link technology-savvy students in ICT-rich Canada with their technology deprived counterparts in Ghana was mind-boggling, to say the least. Despite the challenges, I decided against giving up. Thus, when I moved back to Canada[4] and to Kwantlen University College in the Fall of 2005, I decided to pursue the project.

Looking for funding for the project proved even more daunting. After applying to several external funding agencies with no success, I had to settle for a modest internal funding. In the Spring of 2006, I received a $500 Technology Innovation grant from Kwantlen University College Information and Education department grant to purchase two webcams and a pair of headsets. In the same year, I received Kwantlen University College's Office for Research and Scholarship travel grant. In the Summer of 2006 I travelled to Ghana where I met several potential collaborators at the University of Ghana and to assess the level of technological readiness of the country's premier university. Professor Kojo Senah, who is the current chair of the Sociology Department, signed onto my proposal, cautiously. While I was aware of the yawning digital divide between the Global North and Global South, I was not prepared for what I saw. For example, the entire Department of Sociology had only two computers—one for the secretary and the other for the head of the department.

On my return, I teamed up with Afretech, a Delta, BC-based NGO which supplies used computers to various African countries to collect and ship 40 used computers from Kwantlen University College to the Sociology Department of the University of Ghana. In 2007, I went back to Ghana to follow up on the project. I met with the Director of the Information Technology Directorate, Mr. Emmanuel Owusu-Oware, who enthusiastically also signed on to the project. He immediately assigned his deputy, Ms Ama Dadson and Mr. Patrick Kuti, the directorate's web-developer to work with on the project. He has made available UGL's a well-equipped lab for students.

It is pertinent to mention that the University of Ghana, Legon has had Internet connectivity some time now. In fact, UGL is one of the participant institutions taking part in the African Virtual University (AVU) project. The AVU was set up in 1995 under the auspices of the World Bank as "a satellite based distance education project whose objectives are to deliver to countries of Sub-Saharan Africa (SSA), university education in the discipline of science and engineering, non-credit/continuing education programs and remedial instruction"

[4] I moved to Central Michigan University in 2003, after a decade of teaching at the departments of Communication Studies and Sociology and Anthropology.

(http://www.etw.org/2003/case_studies/soc_inc_africa_VU.htm) .

From August 2007 to October 2007, Patrick and I tried a number of course delivery systems, notably Adobe Connect, Elluminate, and Yugma. We tried Adobe Connect first, because Kwantlen University College has just purchased a licence for it. Unfortunately, we had a hell of time with it. In fact, about half of the trial period was spent on Adobe Connect. Most of the time, I could hear and see Patrick. However, he could hear and see me some times, but other times he could not. There was constant feedback and delays in the audio transmission. At this stage, I decided to "hit" the Internet, sending blind messages asking for suggestions. It was through one such blind message that I got in touch with Sandy Hirtz of BCCampus, who offered not only to be my course assistant gratis, but also offered her Elluminate virtual meeting room for the course. Prior to that, LearningTimes.org had awarded me its Global Collaboration Grant, which consisted of one Member Office with a capacity of 25 users. In addition, Elluminate, a web-conferencing company offered me a four-month free trial and training beginning in May 2007.

The near miss

After frantic efforts throughout the summer, after my return from Ghana, to link up with my collaborator, Dr. Senah, Dr. Akosua Darkwah also of the Sociology Department of UGL, was suggested as a replacement. Dr. Senah had been quite busy teaching and also attending conferences in Europe. My several emails and phone calls were not returned. My attempt to seek my colleagues input in crafting the course syllabus proved futile. When all seemed to be lost, I managed to reach Dr. Senah, eventually. He then suggested I contacted Dr. Darkwah, who he said teaches a graduate course in Globalization. This was mid-December 2007. Thankfully, Dr. Darkwah readily accepted the challenge. Her biggest headache was how to get in touch with her 12 graduate students, who because of the closure of the UGL due to the African Cup of Nations Soccer Tournament, were scattered all over the country. In the end, with dodged determination, she managed to get six of the students to enroll in the course. Had Dr. Darkwah not agreed at the last moment to team up with me, the project would have been a non-starter, and for this I am deeply indebted to her.

THE COURSE WEBSITE AND "BELLS AND WHISTLES"

Concurrently, Information and Educational Technology (IET) Department was building course website on Moodle for the project. Meg Goodine of IET was a consultant for the project. She assigned Sue Birthwell of IET to assist the University of Ghana Online Collaborative Learning Project in the following ways:

- Production of course (i.e., identifying and engineering course content for digital delivery format)
- Administration of tech support for faculty, students;
- Maintenance of course (content management)
- Administration of delivery of course from KUC to Ghana using course management system (Elluminate)
- Consultation, training: faculty preparation for online teaching and course facilitation

Course format

The class met twice a week on Mondays and Thursdays. The instructors lectured on Thursday and devote Monday to laboratory work, where students complete assignments, held discussions, and conducted collaborative research for their group projects. The labs were supervised by the course assistants—Kaelan Wong at the KUC site, Patrick Kuti at UGL, and Sandy Hirtz at a "virtual site."

Course requirements and evaluation

Exams covered class lectures and discussions, assigned readings, and audio-visual presentations. There were **two take-home exams**—a mid-term and a final.

Quizzes

Three quizzes were given over the course of the semester. The quizzes were short tests that primarily evaluated students' retention of readings. Students took the quizzes online in the course of the day, in their free time. The quizzes were activated from 08:00 A.M. until 23:55 P.M. (PT). The quizzes, which comprised multiple-choice and true-or-false questions and short questions, were for only the Kwantlen University College students. Dr. Darkwah gave her graduate students replacement assignments, commensurate with their level.

Assignments[5]

WEEKLY ELECTRONIC (E-) ESSAYS AND CHAPTER SUMMARIES: Each student was required to provide a summary/synopsis of a chapter from the course main text (G & L), in no more than 300 words, and write a 200-word reaction essay of the week's assigned reading/chapter, for a total of 500 words or roughly one-and-a-half single-spaced page. Each essay was to begin with a brief synopsis (summary) of the central assumptions and premises of the reading followed by the student's answer to the chapter issue question. For example, the issue question for chapter five is "To what extent did early globalization affect peoples of the world?"

Students were encouraged to react to the lectures, class discussions, the readings, videos, other students' essays, and the course as a whole. Meaningful reactions could be used as bonus points. I examined each student's reaction to determine whether or not it merited a bonus point. Students earned up to 10 bonus points, i.e., 10 reaction submissions. All reactions were posted at OUR GLBAL VILLAGE.

Introductory presentation

On the first day of class, each student was asked to post a brief background and a photo at the course website. This was to give instructors an opportunity to know the students and indeed also for the students to know one another, particular students in the remote sites.

Group projects

The group project was made of two parts—Research and Presentation.

RESEARCH

By the third week of the semester, participants in the course were assigned to a global collaborative research team called Global Virtual Teams.[6] Each Global Virtual Team consisted of five persons (four from KUC and one from UGL.) Each Virtual Team was assigned one of five stakeholder perspectives: (1) global private sector; (2) international organization; (3) developed country national government; (4) developing country national government; and (5) non-governmental organization (non-state actors or NGO). These Global Virtual Teams were tasked with a research problem and a role-playing exercise. Each global virtual team was expected to develop a 4,000–5,000 word e-essay/paper and a 15-minute (Address to Humanity) presentation on the following research questions:

- What is Globalization?
- Why has it attracted much controversy, supporters and detractors?
- How has globalization contributed to the wealth and poverty of nations? Identify the problems and promises of globalization.
- What roles should governments, individuals, civic society, the UN play in this?
- Propose three ways in which valued resources such as energy, food, shelter, medicine, etc., can be equitably and justly distributed.
- The paper must be based on one of the areas to be covered in the course listed below.

PRESENTATION

Fifteen-Minute Address to Humanity:
Mock UN Assembly Meeting: The Global Virtual Teams were expected to present a summary of their paper to an imaginary United Nations session devoted to Globalization. This was done during the four weeks of the term/semester.

Culture	Social Justice	Economic Development
Indigenous Peoples	Foreign Policy	Global Climate
Global Health	International Conflict	Democracy
Migration	Religion	Trade
The Media	Women	Children
Human Rights	Racial/Ethnic Minorities	Senior Citizens

Course evaluation

Each student was expected to prepare a two to five-page evaluation of the course and its approach that should be submitted in electronic format.

[5] These assignments were adapted from Professor Derrick Cogburn's seminar course on Globalization and Information Society.

[6] An adaptation of Global Syndicate approach used at the University of the Witwatersrand.

The course takes off

The course started on January 7, 2008 at 8:00 A.M. PST and 4:00 P.M. Ghana Time and 8:00 P.M. in Bangalore, India, with 35 students at Kwantlen University College, six students in Ghana, and one student in Bangalore, India. Initially, we anticipated twice the number of Kwantlen students taking the course from UGL. This was not to be, because the University of Ghana was closed due to the African Cup of Nations Football (Soccer) Tournament that was held in Ghana in the months of January and February. Thus, six graduate students ended up enrolling in the course, instead of about 70 potential undergraduate students.

The course was held in labs equipped with computers, projectors and screens at both sites—KUC and UGL. I had two course assistants, Kaelan Wong, a Kwantlen University College science major, and Sandy Hirtz of BCcampus. Dr. Darkwah was assisted by Mr. Patrick Kuti, webmaster for UGL. The lone student in Bangalore in India—Laura Johnson accessed the course through a computer terminal.

Division of labour

Dr. Darkwah and I agreed at the planning stage that we divided the lecture and discussion sessions between us. I was to lead the lectures and discussions for the month of January and Dr. Darkwah was to take over in February. I was to take over in March and April. The lab sessions were conducted by course assistant Kaelan with assistance from me and Sandy.

DAY ONE

A virtual interactive classroom was the first of its kind at Kwantlen University College. Naturally, day one was filled with anxiety and uncertainty, but also anticipation and excitement. Neither I nor my students and course assistants had any idea what to expect. I did my best to assuage the fears and uncertainties of my students by assuring them that the course was a steep learning curve for all of us—instructors, course assistants and students.

Sandy Hirtz is an expert in Elluminate, being the BCcampus Online Community Producer. Kaelan took training courses in Elluminate and Moodle during the Summer. I had gone through my own training a year ago, but to what to extent the amount of training will come into play could only be gauged when interacting with the students. Both programs seemed straightforward enough. The interface was laid out in a user-friendly format. Icons were for the most part appropriately assigned.

The first day was devoted to familiarizing students with the "bells and whistles"—the technological aspects of the course. This was done superbly by course assistant Sandy Hirtz of BCCampus. It was decided that it would be best if there was some way to record each lecture and have them posted online for student access. This would allow students to revisit the lecture should there be a technological failure that day. The first attempt was made by utilizing a digital video camera to record the lecture and then uploading it online. This method had to be abandoned due to the large file size of digitized two-hour lecture recording. The Moodle server was unable to host such a large file. Other programs were looked at as a possibility to record the lecture but in the end, the built in recording tool in the Elluminate program was used due to its simplicity and ease of access for students. Recordings were saved via the Elluminate website and a link was provided to each recorded lecture.

For the most part, Elluminate showed very little problems with execution. PowerPoint lectures were loaded onto the whiteboard in the program and students from both BC and Ghana can view them on their own computers. The audio was clear, although there was some delay when transmitting from Ghana. Due to this problem, audio output was only limited to one set of speakers. Multiple speaker outputs from different computers produced a garbled effect in that each computer were receiving the audio at different rates. The web camera was available for use to see students from both sides of the globe. This, however, was rarely utilized. The whiteboard was also used when students were asked for their input during lectures. A blank whiteboard would be put up and students would type in their ideas so that everyone can see it. Most students actively participated during these sessions. During lab sessions, students used the whiteboard to communicate with their fellow group members as well as compile their lab work.

There were complaints from a number of students that the whiteboard was not a very effective method for placing text. First of all, since its functions mirrored that of Windows Paint, it is limited in its word processing capabilities. Students have suggested that it should have a built in word processor for working on collaborative lab work. Also, frustration arose when students wanted to save their lab work and be able to edit it at home. The whiteboard can only be saved as a whiteboard file and so it was not compatible with other word editing software. Also, the file can only be opened in Elluminate.

The only option that students had was to use the "print screen" function and save an image of their work.

This, of course, was not editable in Micrsoft Word. In addition, even though the print screen function was an instant solution for those who are more adept with computers; novice users found it to be both confusing and frustrating. These students resorted to using the whiteboard for brainstorming ideas and having one group member, taking the ideas and typing it in an alternate word processing program. Some students avoided using Elluminate during labs and, instead, used Messenger to communicate with their group. So, there was a mix bag of reactions from the students.

There was also apprehension when it came to using the microphones to communicate with the class. Students were each provided with headsets that had built in microphones but only a couple of students actually used it. When asked to participate in such discussions, students did not readily volunteer.

In Moodle online assignment submissions, one of most frequent problems encountered was that students tend to forget and spend long periods of time typing up their assignment in Moodle, only to have it "disappear" when the time out feature dissipated their work into virtual oblivion. Also, only one student can submit their work at any one time and the submission text box cannot be utilized by another student until they are done.

Project hits a snag: Internet "inconnectivity"

The course hit its major snag in the second month of February. In February, it was it was Professor Darkwah of Ghana's turn to deliver the lectures via Elluminate. The first lecture held on February 7, went fairly smoothly. However, the second lecture on February 14 was another matter altogether. The African Nations Football (Soccer) Tournament had come to an end and the University of Ghana students have returned to campus. With thousands of the students using the email, the network was overloaded and overwhelmed. Thus, Dr. Darkwah and her students could not connect to Elluminate. The solution was to have Dr. Darkwah record her lectures using audacity and have them posted on Moodle for the Canadian students. But this was not to be, as Dr. Darkwah's lecture did not record. And this was a huge blow, because the students really enjoyed Dr. Darkwah's lecture. Several of them made unsolicited complimentary comments after her first lecture and were anticipating her subsequent lectures. The second lecture lasted no more than 30 minutes when she was cut off. At this juncture, it became clear that until the problem of connectivity was solved, we both must conduct our lectures separately. Thus, for the rest of February, the lectures were conducted at the separate sites. My lectures were posted at Moodle for the Ghanaian students. Dr. Darkwah has promised to re-record her lecture own lectures and have them posted at Moodle.

Course content

Students in general, thought that the course content was intriguing. Issues regarding globalization, poverty, inequities, etc. were put under a magnifying glass by a combination of articles, videos, and lectures. Students showed educational growth in their essays as their "eyes were opened" to the other side. Students were taught to look past the obvious when examining such issues.

Student reactions

During the first few lab sessions, there were many students who expressed frustrations with using Elluminate and Moodle. This was understandable. Students' training in both programs was short—one class session or three hours. Although students were constantly assisted and "re-trained" throughout the first few weeks, there was not enough time to really learn to use the programs, especially, Elluminate. In short, there was not enough training time to enable students to learn to use the programs competently and comfortably. One suggestion is that perhaps having a structured training session during the first two lectures to train the students in both Moodle and Elluminate. This will alleviate student frustration and confusion. Most students expressed the view that they were "confused most of the time" but they were happy with the timely responses to their inquiries and the availability of a course assistant to bridge the gap between them and the course instructor. They were further put at ease when they were told that this method of course delivery was new to both faculty and students and that any confusion and frustration that they were experiencing was to be expected. They were encouraged to voice their opinions throughout the duration of the semester. In fact, in my first lecture, I told the students that since the course was technology-intensive, it was going to be a steep learning curve for both students and instructors, and that there were likely to be technological glitches and blackouts.

Conclusion

> "It is my hope that as they leave the course and the semester, each student can confidently declare to her or his family and friends: 'Guess what, I entered the virtual classroom and came out at the pinnacle of the future classroom without walls with a better understanding of the wired world and the global village'." – Charles Quist-Adade (2008)

CONCLUSION: LESSON LEARNED AND UNLEARNED

At the time of writing this chapter, the course has just cruised through mid-stream. Six weeks more remain before the course wraps up. It is still uncertain if Dr. Darkwah and her students can connect with us via Elluminate. The maiden launch of this method of course delivery did pose several problems in regards to technological barriers and students' handle on Elluminate and Moodle. My colleague and I did experience varying levels of frustrations and disappointment. The course assistant at the UGL site, Patrick Kuti certainly had more than his fair share of disappointments and frustrations.

I am more than convinced that if I had had luck with funding, the course would have more successful than it was. For example, if we had extra dollars, it would have been possible for Dr. Darkwah to conduct her lecture from Busynet, a private Internet provider when the University of Ghana network was facing connectivity problems. Nonetheless, many students were excited to be a part of this experience. To many, the sheer thrill of connecting and sharing a classroom, albeit virtual, with a fellow student as far away as Ghana and India is itself a veritable learning and life changing experience.

While I suffered a couple paroxysms of frustration and angst during the planning stages and techno-shocks during the first half of the course, I must state emphatically that I have enjoyed every moment of the journey so far. It was a huge learning curve for everyone but even more so for the students. As they learned to embrace this course, it became increasingly apparent from their essays, Internet discussions, and voluntary comments to me and my course assistant, Kaelan that, they are likely to take away from the course more than they anticipated. It is my hope that as they leave the course and the semester, each student can confidently declare to her or his family and friends: "Guess what, I entered the virtual classroom and came out at the pinnacle of the future classroom without walls with a better understanding of the wired world and the global village."

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4
Addressing Diversity in Design of Online Courses

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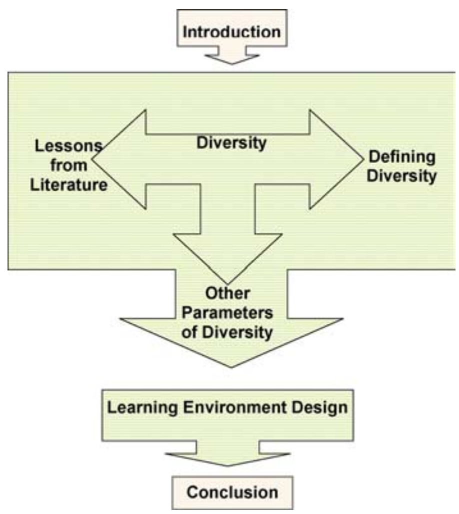
. . . everybody who is human has something to express. Try not expressing yourself for twenty-four hours and see what happens. You will nearly burst. You will want to write a long letter or draw a picture or sing, or make a dress or a garden. – Ueland (1987)



Learning outcomes

After completing this chapter, you should be able to:

- Demonstrate the knowledge and understanding of the emerging issues of diversity for online learning.
- Explain different definitions of diversity with references from literature.
- Identify the different parameters of diversity.
- Analyze different learner characteristics and their online behaviour.
- Prioritize different parameters of diversity according to their importance for designing online courses.
- Design learning environments to sustain motivation in online courses.

Introduction

> "In the life of the human spirit, words are action, much more so than many of us may realize who live in countries where freedom of expression is taken for granted. The leaders of totalitarian nations understand this very well. The proof is that words are precisely the action for which dissidents in those countries are being persecuted". – Carter (1977)

The world is shrinking rapidly. The Internet has brought the world together in ways that nobody would have expected. You can now attend a college halfway around the world, with students from any country with Internet access. People will telecommute to their jobs more in the future, while their companies compete globally (elearners.com). Many countries around the world are experiencing increasing diversity amongst their populations (Wentling & Palma-Rivas, 2000). While this is having a major impact on organizations within the business sector (Thomas, 1995), higher education institutions are also feeling the effects of increasing diversity within student populations (Smith, 1995). The last decade in particular has seen an increasing trend towards globalization (Farrell, 2001) particularly with the introduction of the World Wide Web and the Internet. As a result the tertiary education landscape has changed considerably as institutions seek new and innovative ways to meet the needs of a growing and increasingly diverse student population (Rumble & Latchem, 2004). Online learning, or e-learning, is an increasingly popular method being used by institutions to meet the requirements of the changing learning landscape (Dimitrova, Sadler, Hatzipanagos & Murphy, 2003).

Diversity

Within any group of people there will be many aspects of diversity. Whether the focus of investigation is a sports team, a school class, a work group within an organization, or a group of online learners, these groups are made up of individuals who differ on at least some dimensions of diversity (Maznevski, 1994). While many would acknowledge that no two persons are alike in every respect and therefore can be regarded as diverse relative to each other, it is the similarities between some specified group of people and differences to other groups that has been the focus of much research on diversity (Cox, 1993; Hofstede, 2004; Thomas, 1995; Triandis, 1995b). Indeed it is this ability to identify meaningful distinctions that make diversity a useful and extensively studied concept (Nkomo, 1995).

Defining diversity

That diversity is a complex issue is reflected in the difficulty in defining what diversity is (Smith, 1995). In order to make some sense of the countless potential sources of diversity among groups of people numerous definitions have arisen. Within organizations diversity is "typically seen to be composed of variations in race, gender, ethnicity, nationality, sexual orientation, physical abilities, social class, age, and other such socially meaningful categorizations" (Ferdman, 1995, p. 37). In other words diversity measures are assumed to capture a perception of similarities and differences among individuals in a group or organization (Wise & Tschirhart, 2000).

Wentling and Palma-Rivas (2000) point out that there are many definitions of diversity that range from narrow to very broad. Narrow definitions of diversity tend to focus on observable or visible dimensions of difference (Milliken & Martins, 1996) which Lumby (2006) asserts are likely to evoke bias, prejudice, or the use of stereotypes leading to disadvantage. These include ethnicity, race, gender, disability, and age. Indeed much of the organizational diversity research has tended to focus on the identification of differences between the cultural majority and particular minorities in the workplace with regard to race, culture, and gender (Thomas, 1995). As a result of this somewhat narrow focus some argue that the term diversity should only pertain to particular disadvantaged groups (Wise & Tschirhart, 2000). A direct consequence of this is the current politicised nature of the discussion which has seen diversity become synonymous with affirmative action where diversity is seen as a means of fostering the recruitment, promotion, and retention of members of a particular group (Thomas, 2006).

Not all agree with this view and argue that the definition of diversity is much broader and is continually changing and evolving (Smith, 1995). Broader meanings of diversity tend to encompass a greater variety of characteristics that are not immediately observable or public. These include dimensions such as educational background, national origin, religion, sexual orientation, values, ethnic culture, education, language, lifestyle, beliefs, physical appearance, economic status, and leadership style (Cox, 1993; Lumby, 2006; Thomas, 1995, 1996; Wentling & Palma-Rivas, 2000). Still others take account of additional dimensions such as political views, work experience/professional background, personality type and other demographic socioeconomic, and psychographic characteristics (Gardenswartz & Rowe, 1998; Thomas, 1995; Wise & Tschirhart, 2000).

Maznevski (1994) differentiates between two main types of diversity characteristics, namely, role-related diversity such as occupation, knowledge, skills, and family role; and inherent (to the person) diversity such as gender, age, nationality, cultural values, and personality. In contrast, McGrath, Berdahl & Arrow (1995) developed a more comprehensive framework of diversity attributes using clusters.

What these different definitions highlight is the breadth and variety of understanding of what diversity is and can encompass. Thomas' (1996, pp. 5–8) definition of diversity is an attempt to reflect this broadness as well as acknowledge that any discussion about diversity must make explicit the dimensions being explored. He defines diversity as "any mixture of items characterized by differences and similarities". Key characteristics of diversity include:

- Diversity is not synonymous with differences, but encompasses differences and similarities.
- Diversity refers to the collective (all-inclusive) mixture of differences and similarities along a given dimension.
- The component elements in diversity mixtures can vary, and so a discussion of diversity must specify the dimensions in question.

Lessons from the literature

A significant diversity dimension that has received considerable attention and research is that of culture (Cox, 1993; Hofstede, 2004; Triandis, 1994). Much of the drive for this has come from the increasing types and degrees of diversity occurring within organizations in an increasingly globalized marketplace and the need to manage this process to achieve effective functioning of work groups (Maznevski, 1994).

Historically the definition of culture has been contentious, resulting in numerous definitions by researchers (Erez & Earley, 1993; Triandis, 1996). Shweder and LeVine (1984) and D'Andrade (1984) defined culture as a shared meaning system within a group of people. Hofstede (1980), on the other hand, described culture as a set of mental programs that control an individual's responses in a given context. Still others (Triandis, 1972; 1995b) have viewed it as consisting of shared elements of subjective perception and behaviour where the subjective aspects of culture include the categories of social stimuli, associations, beliefs, attitudes, norms, and values, and roles of individuals who share a common language and live during the same historical time period in a shared geographical location. Triandis (1996) also identified subjective culture as being a function of the ecology (terrain, climate, flora and fauna, natural resources) linked to the maintenance system (subsistence and settlement patterns, social structures, means of production) within which it is situated.

Even though there are multiple definitions most agree that culture consists of shared elements "that provide the standards for perceiving, believing, evaluating, communicating, and acting among those who share a language, a historic period, and a geographic location (Triandis, 1996, p. 408). It's important to note that most countries consist of hundreds of cultures and subcultures (Triandis, 1995b) and that culture is not synonymous with nations, although it is often discussed this way in the literature (Erez & Earley, 1993).

One of the most widely used and quoted studies on culture is the seminal work of Hofstede (1980; Hofstede, 2001), which studied cultural differences in a large multinational organization with data from more than 40 countries. He developed a five-dimensional model that took account of cultural variation in values. According to this research, the five dimensions on which culture vary are power distance, uncertainty avoidance, individualism versus collectivism, masculinity versus femininity, and long-term versus short-term orientation.

Power distance describes the way in which members of the culture accept inequality of power, that is, the unequal sharing of power; *uncertainty avoidance* reflects the degree to which a culture emphasizes the importance of rules, norms, and standards for acceptable behaviour; *individualism versus collectivism* relates to the degree to which individuals are integrated into primary groups or in-groups (Triandis, 2001); *masculinity versus femininity* refers to the division of roles based on gender;

and *long-term versus short-term orientation* highlights the predominant focus of people within the group, namely the future or the present (Hofstede, 2001, p. 29). Of these five dimensions most of the variance in the data was accounted for by the individualism and collectivism (I-C) dimension. Since the publication of the original work in 1980 a multitude of research and theory has the I-C dimension as a focus (Church, 2000; Triandis, 2004).

Triandis (1995b) defines individualism as "a social pattern that consists of loosely linked individuals who view themselves as independent of collectives; are primarily motivated by their own preferences, needs, rights, and the contracts they have established with others; give priority to personal goals over the goals of others; and emphasize rational analyses of the advantages and disadvantages to associating with others". Collectivism on the other hand is "a social pattern consisting of closely linked individuals who see themselves as parts of one or more collectives (family, co-workers, tribe, nation); are primarily motivated by the norms of, and duties imposed by, those collectives; are willing to give priority to the goals of these collectives over their own personal goals; and emphasize their connectedness to members of these collectives" (p. 2). These differences can be summarised as:

- A sense of self as independent versus self that is connected to in-groups. Markus and Kitayama (1991) view this as independent versus the interdependent self-construal
- Personal goals have priority versus group goals have priority
- Social behaviour guided by attitudes, personal needs and rights versus social behaviour guided by norms, obligations, and duties (Church, 2000; Triandis, 1995b)

In addition to these general contrasts the following attributes tend to be reflective of the I-C dimension (see Table 4.1).

It is important to note that to this point the terms individualism and collectivism and the corresponding attributes refer to the cultural level where the unit of analysis is the culture (i.e., between culture analyses) and individualism is the opposite of collectivism (Hofstede, 1980). To make the distinction between the cultural and individual level of analysis (i.e., within-culture analyses), Triandis Leung, Villareal & Clack (1985) used the terms idiocentrism and allocentrism (I-A) that describe individual personality attributes (Triandis and Suh, 2002, p. 140).

Table 4.1. Attributes of individualist and collectivist cultures

Attributes	Individualist	Collectivist
Self-perception	individual	group
Attributions	internal causes	external causes
Prediction of behaviour more accurate based on	internal dispositions such as personality traits or attitudes	social roles or norms
Identity & emotions	ego-focused	relationships & group membership; other focused
Motivation	emphasize abilities	emphasize effort
Cognition	see themselves as stable and the environment as changeable	see their environment as stable and themselves as changeable/ flexible
Attitudes	self-reliance, hedonism, competition, emotional detachment from in-groups	sociability, interdependence, family integrity
Norms	curiosity, broadminded, creative, having an exciting and varied life	family security, social order, respect for tradition, honouring parents and elders, security and politeness
Social behaviour	personality more evident	influenced by behaviour and thoughts of others; shifts depending on context
Attitudes towards privacy	personal business is private	personal business is also business of group
Communication	• direct • emphasizes content and clarity • frequent use of "I"	• message is indirect and reliant on hints, eyes bodies, etc. • emphasizes context and concern for feelings and face-saving • frequent use of "we"
Conflict resolution	more direct	obliging, avoiding, integrating, & compromising styles
Morality	prefer attitudes and behaviour are consistent	• contextual and focused on welfare of the collective • linked to adherence of many rules
Responsibility	individual	collective
Professional behaviour	promotion based on personal attributes	promotion on the basis of seniority & loyalty

Sources: (Church, 2000; Triandis, 1995b; Triandis and Suh, 2002)

Idiocentrics emphasize self-reliance, competition, uniqueness, hedonism, and emotional distance from in-groups. Allocentrics emphasize interdependence, sociability, and family integrity; they take into account the needs and wishes of in-group members, feel close in their relationships to their in-group, and appear to others as responsive to their needs and concerns.

At the individual level of analysis idiocentrism and allocentrism are often orthogonal to each other meaning that individuals can and often do exhibit attributes of both. In addition idiocentrics and allocentrics are found in all cultures (Triandis & Suh, 2002). It's also been found that idiocentrism tends to increase with affluence, leadership, education, international travel, and social mobility; is more likely if migration to another culture has occurred; and in cases of high exposure to Western mass media. Allocentrism is more likely if individuals are financially dependent; of low social class; have limited education; undertaken little travel, socialized in a traditionally religious environment; and acculturated in collectivist culture (Triandis & Trafimow, 2001, cited in Triandis, 2006). Additionally allocentrism and idiocentrism attributes are dependent on context (Triandis, 1995a). Triandis (2006) also notes that globalization is essentially compatible with individualism and idiocentrism. This has the effect of complicating the discussion about I-C cultures and in turn the discussion on diversity.

Ferdman (1995) also discussed the gap between group differences and individual uniqueness using the concept of cultural identity. He argued that "culture is by definition a concept used to describe a social collective" (p. 41) but that values, norms and behaviours ascribed to a particular culture are expressed by individuals who vary in their image of the group's culture as reflected in individual-level constructions. In other words diversity does not just apply to differences between groups but also within-group differences and the "concept of cultural identity suggests that simply having some representatives of a particular group may not adequately reflect the full range of diversity" (p. 56). Cox (1993) argues that many individuals belong to multiple groups and that group identity develops when there is an affiliation with other people who share certain things in common. Indeed "various group identities play a part in how we define ourselves" (p. 43) and how we behave as individuals. The growing recognition that globalization is giving rise to more multicultural or complex hybrid identity development of young people is a case in point (Lam, 2006). This in turn "shifts our understanding of culture from stable identities, categorical memberships, and holistic traits to ways of *acting and participating* in diverse social groups and the heterogeneous sets of cultural knowledge, skills, and competence that are required in the process" (p. 217).

While some have warned against describing both cultural and individual characteristics using a broad dichotomy such as I-C (Church & Lonner, 1998) and that different selves are accessible in different contexts (Trafimow, Triandis & Goto, 1991), given the accumulated research in this area and continuing dominance the I-C dimension it seems an appropriate and valid dimension to consider when attempting to address issues of diversity in the online learning environment.

Other paradigms of diversity

In the design of online learning environment it is not only the diversity among people which is of utmost importance it is also the diversity among available resources and technologies, subject area, methods of assessment, and capabilities of both faculty and students to handle the technologies and their expectations from each other and from the course (Bhattacharya and Jorgensen, 2006).

In reality all the parameters or aspects of diversity are intermingled and intertwined with each other. The ideas or solutions can not be presented as stand-alone to address a single aspect of diversity; they are as complex and interlinked as a kaleidoscope, with the pieces connected to all the other pieces and to the whole. They interact with one another, and in that interaction change the dynamics. Make one small twist on the kaleidoscope, and the pieces shift into another pattern (Thomas and Woodruff, 1999). Therefore knowledge about diversity and the related issues are useful for developing online learning environments, but are not enough to design courses which will suit individual needs, expectations, interests, and so on. There are definitely no simple solutions or ideal conditions for designing online courses to address the issues of diversity.

In the following section we have identified some of the design principles for creating online learning environments to cater to diversity and discussed some of the innovations we have tried in this regard. Our motto is to "address diversity through variety".

Learning environment design

Success indicator or effectiveness of any learning environment design is judged by students' satisfaction and success rate. Both satisfaction and success depend on sustaining interest and motivation for learning. Much research is needed to identify the different motivating factors for learning and the strategies for sustaining learners' motivation in online courses. Most of the online courses are attended by the students who are busy professionals, or who do not have access to face-to-face education. These students are highly motivated to learn, although they have different motivations or objectives for learning. So our challenges are to sustain students' motivation in the online environment, provide challenges, provide support, and facilitate learning. One of the primary aspects of sustaining interest in online courses is to provide opportunities for interactions. People are, above all else, members of social groups and products of the historical experiences of those groups (Wood, 2004).

Some of the basic principles of instructional (interaction) design are:

- Design and use learning activities that engage students in active learning.
- Provide meaningful and authentic learning experiences that help learners apply course concepts and achieve course objectives.
- Use strategies that consider the different learning styles of students.

The teacher as the leader and designer of the learning environment must possess and inculcate fundamentals of embracing diversity (Sonnenschein, 1999) which include:

- *Respect*—for others, for differences, for ourselves.
- *Tolerance*—for ambiguities in language, style, behaviour.
- *Flexibility*—in situations that are new, difficult and challenging.
- *Self-awareness*—be sure you understand your reactions and know what you bring to the diverse workplace (learning environment).
- *Empathy*—to feel what someone different from you might be feeling in new and strange surroundings.
- *Patience*—for change that can be slow, and diversity situations that might be difficult.
- *Humour*—because when we lose our sense of humour, we lose our sense of humanity, as well as perspectives (p. 9).

The instructor or designer has to be creative, and use several different activities and interactivity to engage students and enhance their learning experience in an online course. These could be done through introduction of case studies, reflective journals, research reports, eportfolios, wikis, blogs, podcasts, simulations and games, authentic group projects through problem-based or inquiry-based learning, tests, quizzes, synchronous chat and asynchronous discussion forums, audio-videoconferences via Internet, etc. The instructor will have to develop strategies and techniques for establishing and maintaining learning communities among distance learners through the use of learning technologies. This will help to overcome the isolation that students can experience when taking an online course and also provide opportunities for collaboration and sharing knowledge and expertise.

We have conducted online collaborative problem-based learning for distance students. It was initially very difficult for the students to adapt to the new learning environment. By the end of the course, students realized that much learning had taken place by working in collaborative groups and participating in synchronous and asynchronous interactions using Internet tools. Student reflections revealed that the learning environment allowed them to choose their own problem to work on. They could schedule their work in negotiation with other group members. Students felt a sense of ownership of their work. Some students indicated that they were so involved in finding solutions for a problem or resolving an issue that at times they forgot that they were doing the activities for a course assignment. Assessment was done for the acquisition of higher order cognitive skills, e.g., critical thinking, decision-making, reflection, problem solving, scientific, and research skills. Self reflection, peer assessment and feedback are also a part of the peer-based learning process. In the process students also acquired valuable social and interpersonal skills through collaborative activities (Bhattacharya, 2004).

We have introduced e-portfolios in various courses and programs over the years. E-portfolios allow students to integrate and identify the links between the various activities they do in and outside of their formal education. Students can bring in their personal experiences and demonstrate how they have applied the knowledge and skills acquired in actual practice through e-portfolios. Developing e-portfolios and reflecting on the activities allow students to learn about their strengths, weaknesses, interests, and provide them directions for future. It also provides opportunities for teachers to learn about their students: their motivations, their previous experiences, their background, their skills, their attitudes, etc. Students can personalize their learning, and develop communication, organization, presentation, and design skills through development of e-portfolios (Bhattacharya, 2006).

In recent times we have used a combination of freeware for conducting interactive sessions in our online courses. Students were consulted before combining and using the technologies. A quick survey revealed the pros and cons of different technologies. Students and faculty agreed upon a set of tools which would work for them. The process of selecting tools, particularly criteria for selection, preferences, and justifications for using particular tools provided useful data for identifying tools and technologies to mashup to suit different purposes. Examples include Skype, Googledoc, Googlechat, or Skypechat for collaborative group assignments for an online and distance education course. WebCT discussion forums were used for asynchronous interactions among group members. In this course all the synchronous interactions were recorded for future reference and feedback.

Conclusion

In this chapter we have discussed different approaches to designing online courses to address the issues of diversity where diversity is viewed as a strength to be exploited rather than a problem to be solved.

We envisage that in the near future mashups of different technologies will be easier, and students will be able to create their own learning environment by dragging and dropping different tools into one common platform, and access their personalized learning environment with one login.

The online learning environment should be flexible with respect to time and pace of learning. It should provide different forms of active learning and ways of assessment, and give control and choices to the learner. It should allow for the synthesis of formal, informal, and non formal learning to address the issues of diversity.

There is a major issue in that everyday informal learning is disconnected from the formal learning that takes place in our educational institutions. For younger people there is a danger that they will increasingly see school as a turn off—as something irrelevant to their identities and to their lives. Personal learning environments have the potential to bring together these different worlds and inter-relate learning from life with learning from school and college (Pontydysgu, 2007).

Social software and Web 2.0 technologies are increasingly allowing people to create their own learning environments, creating and publishing material, sharing ideas with people, and receiving feedback from not only the teacher or peers but from anyone, anywhere. Our future online courses will have to be dynamic and process-oriented to address the fast-changing nature of the electronic age.

More research, innovation, and developmental work are needed to cater to the demands of future learners. We need to work on developing theories of e-learning to guide teachers and developers of online learning environments (Bhattacharya, 2007). In future students will develop their own personalized learning environments and build their learning communities. Students will be equal partners with teachers in designing assessment activities. Students will have the freedom and right to choose how and when they would like to be assessed.

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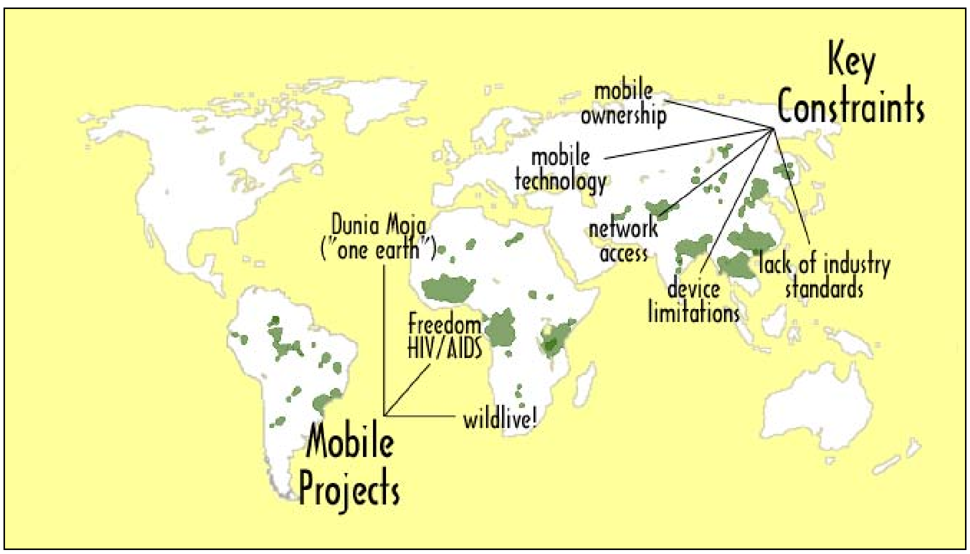
5
Mobile Learning in Developing Countries: Present Realities and Future Possibilities

Ken Banks



Learning outcomes

After completing this chapter, you should be able to:

- Strategize ways in which mobile technologies can help close the digital divide.
- Use devices such as mobile phones and iPods to promote learning in developing nations.
- Compare the benefits to learning of mobile devices with those offered by the traditional classroom.

Introduction

For every personal computer in a developing country there are roughly four mobile phones. Although many of these are likely to be older or low-end models, today's high-end devices have the equivalent processing power of a personal computer from the mid-1990s. In comparison, personal computers today have more number crunching ability than all the computers that took the Apollo rocket to the moon 25 years earlier. The boundary between mobile phones, handheld game consoles, entertainment devices and personal computers is becoming increasingly blurred, with devices such as the Blackberry, Symbian-driven smartphones, GPS-enabled mobile phones, Ultra Mobile PCs, and Nokia's N-Gage breaking new ground. Technology continues to advance at a remarkable pace, opening up new opportunities few people would have considered a few short years ago.

Figure 5.1 South African phone shop (source: http://www.kiwanja.net/gallery/shopsandsigns/kiwanja_south_africa_shops_6.jpg)

Ultra-mobility: a new way to learning

Mobility—and increasingly "ultra mobility"—is the buzzword of the day. According to the CEO of OQO, a manufacturer of Ultra Mobile PCs, "Ultra mobility is the ability to access all of your information, get in touch with anyone you want to, collaborate with anyone, and run any application you want from anywhere on the planet". Convergence is making this possible, with music players, wi-fi connectivity, video cameras, GPS units, and live television capable of running on a single device, often a mobile phone. The days of carrying a separate phone, camera and music player are over. Indeed, many people are beginning to question use of the word *phone* at all, preferring to refer to these new gadgets as mobile communication devices, or digital assistants.

M-learning is a term regularly used to describe the many possibilities opened up by this convergence, whether it be exam results by mobile phone, lecture podcasting via iPod, or structured language games on a Nintendo. These are still early days, and while examples of m-learning in action are continually on the rise the benefits have already begun to be studied and documented. In *"Mobile technologies and learning: A technology update and m-learning project summary"*, Jill Attewell highlights a few examples of her own. According to her findings, m-learning is helping students improve their literacy and numeracy skills and to recognize their existing abilities. It also encourages both independent and collaborative learning experiences and helps learners identify areas where they need assistance and support. It can help combat resistance to the use of information and communication technologies (ICT) that can help bridge the gap between mobile phone literacy and ICT literacy, and it can remove some of the formality from the learning experience which engages reluctant learners. It can also help learners remain more focused for longer periods.

Revolutionizing learning in developing countries

Further studies are painting a picture of today's youth becoming increasingly comfortable and accepting of their new digital lifestyles, powered by always-on technology such as mobile phones, enriched by portable entertainment devices such as iPods, digital cameras, Sony PSPs, and Nintendo's Gameboy. Friendships are made, maintained, and lost online, often in virtual worlds and on social networking sites such as MySpace, Facebook, and Bebo. Much of what we are seeing today—generally out of the classroom but increasingly in it—is technology-driven, but this technology is not universally accessible to all.

Figure 5.2 Mobile learning is increasingly a way of life in developing nations. (Source: http://www.kiwanja.net/gallery/miscellaneous/kiwanja_kenya_SIMPack_1.jpg)

In contrast, the living and learning environments in developing countries can often be quite different. Where mobile technology may prove a complementary extension to teaching methods in the West, for example, improving or enriching the learning experience, in many developing countries it offers the hope of revolutionising learning altogether, even taking it into areas previously starved of reliable or regular education services. This is particularly true in rural areas, which may be characterised by a lack of fixed telephone lines, poor roads and unreliable electricity, poor postal services, few if any personal computers, few teachers, and most likely no Internet access.

What many of these communities will have, however, is mobile network coverage and, if not their own phones, at least access to one. Learning by distance is nothing new in many developing countries, and the mobile phone has the potential to unlock it yet further, expanding its reach and delivering richer, more appropriate, more engaging and interactive content.

But despite the promise, problems remain. Imagine two mobile phone users. One lives in the land of plenty, and owns an iPhone. He or she can access the Internet via free wireless connections dotted around the city, download and play games, keep in contact with friends and family via instant messenger (IM), watch streaming video and live TV, and use as much data, SMS or voice, as they like with a cheap all-inclusive price plan. The other lives in the land of less. He or she uses a shared phone, lives in an area not covered by a data network of any kind, has a sporadic signal, a phone incapable of playing games or video, and has to think twice before sending an SMS or making a voice call because of constant concerns over airtime credit, not to mention worries over how the phone will be recharged if the main electricity doesn't come back for days.

> "Teachers open the door, but you must enter by yourself". – Chinese proverb

Figure 5.3 Text messaging is a powerful tool both for social networking and for learning. (Source: http://www.kiwanja.net/gallery/texting/kiwanja_uganda_texting_2.jpg)

Mobile learning: a tentative step towards Utopia?

During Spring 2007, I was invited to the 16th International World Wide Web Conference in Banff, Canada. I was there to take part in two separate tracks, although the topic was the same—how the mobile phone might help close the digital divide in the developing world. My talk on the first day was more general, discussing the delivery of targeted information—health messages, wildlife alerts, or market prices, for example—via text message (SMS)—and the importance of understanding the complex cultural issues which surround technology adoption in places like sub-Saharan Africa, where I have done most of my conservation, development and technology work. On the second day I sat on an expert panel discussing something a little more specific—access to the Internet via mobile devices under the conditions faced by a developing country.

I started my panel discussion with a short description of what I considered to be Utopia, the ideal conditions under which we'd all like to be working. It went something like this: "Everybody, everywhere wirelessly communicating and accessing a whole range of personally relevant information whenever they like, using a wide variety of compatible devices at high speed and low cost."

This, of course, isn't realistic *anywhere*, let alone in many developing countries, at least not yet. But the specific problems of web delivery in these places are not dissimilar to those faced by anyone looking to work with mobile technologies in the developing world. And, as you would expect, the m-learning community is not exempt. Ageing handsets, limited functionality, lack of bandwidth, issues of literacy and cost are just some of the barriers, and there are many. It is these barriers that I propose to discuss a little later in this chapter.

But for now let's imagine that we *are* living in Utopia and almost anything is possible. The sky's the limit! What would that look like? Given a high-end mobile device—mobile phones, personal digital assistants (PDAs), pocket PCs, and even things like iPods—what could we do? More to the point, what would *students* require it to do to make their learning experience more engaging, enjoyable, and productive, assuming these are key objectives? Would their mobile learning experience be largely based on video lectures? Collaboration with other students via online blogs and wikis? Playing games and "learning by doing"? Schooling in a virtual world with virtual classmates, teachers and desks? Pitting students against one another through online spelling and math competitions? Mobile-delivered examinations? All of these? More?

Some of these things, of course, are already happening. The University of California in Berkeley recently began posting entire lectures on YouTube and, of course, YouTube content is accessible via mobile devices. A lecturer at Bradford University in the UK early last year went as far as abolishing traditional lectures altogether in favour of podcasts, in his words "freeing up more time for smaller group teaching". And children can learn to count, spell or even play guitar using Java-based mobile games, downloadable from the Internet or directly onto their phones via a carrier portal.

Three projects

The closer you are to the optimum device and network conditions the more things become possible. Three projects highlighted below take advantage of some of these optimum conditions, but use the technology in slightly different ways and aim at subtly different target audiences. The first, wildlive!, sets out to raise awareness of wildlife conservation among the general public, whoever and wherever they may be. The second, Freedom HIV/AIDS, was more specific, targeting members of the public in developing countries particularly at risk for contracting the disease. The third, Dunia Moja, is a lecture and class-based education tool aimed at a controlled group of students taking a particular university course.

WILDLIVE!

As 2002 came to a close, a visionary team at Fauna & Flora International, a Cambridge (UK) based conservation organization, began looking at ways emerging mobile technology could be used to promote their international conservation effort. A new breed of handset was coming to market, with colour screens, Internet access, video capability, cameras, and the ability to play games. wildlive! was launched in the UK in 2003, and then across Europe in 2004, and adopted a combined web- and WAP-approach, meaning that it provided conservation content on the Internet *and* mobile phones. News, diaries, discussions, and other information was added to the website, which was then rendered for mobile devices accessing via the Vodafone network. A *community of interest* was created, allowing users to contact others with similar ideas and views, and a wide range of conservation-based resources and downloads were made available online. Among this innovative range of content were five mobile games which taught users about gorilla, turtle, and tiger conservation while they roamed around a mixture of environments. Another was a 500-question quiz based on zoology and biology. The project received considerable attention, was nominated for an award, and is still seen as groundbreaking today.

FREEDOM HIV/AIDS

Originally developed for the Indian market, Freedom HIV/AIDS was launched on World AIDS Day, 2005, and sought to use mobile phones to take HIV/AIDS education to the masses. A number of games were developed including "Penalty Shootout" and "Mission Messenger". In the shootout game, the player was given points for saving penalties, and received tips on how to avoid HIV/AIDS transmission. At the same time it sought to dispel myths surrounding the disease. In the second game, the player "flies" across the African continent distributing red ribbons and condoms, spreading messages of HIV/AIDS awareness, prevention, transmission, and safety. The games, originally developed for the Indian market, have been translated into a number of African languages.

DUNIA MOJA

Dunia Moja, or *one earth* in Swahili, seeks to use "mobile technologies to connect international students and faculty to stimulate learning and debate in environmental sciences". This innovative project, piloted in 2007, was a collaboration between Stanford University and three African academic institutions—the University of the Western Cape in South Africa, Mweka College of African Wildlife Management in Tanzania, and Makerere University in Uganda. The project used high-end PDAs to allow students to download and watch video lectures from academic staff in each of the partner universities, and contribute to the discussion and debate through mobile blogging to a central website. The course was centred around global environmental issues and their impact on the African continent and the United States, and brought local perspectives and viewpoints to bear on the course topics. Faculty and students from the four participating institutions electronically shared course materials, exchanged information, and contributed their own course content. In m-learning in developing countries, Dunia Moja is a pioneering first.

As these three interventions (and there are many more out there) show, much is possible if you have higher-end devices and a fast, reliable data network at your disposal. In the land of plenty the sky really is the limit. In the land of less, however, we have fewer choices.

> "Character cannot be developed in peace and quiet. Only through experience of trial and suffering can the soul be strengthened, ambition inspired, and success achieved". – Helen Keller

The challenges ahead

Furthering the advance of m-learning in developing countries is governed by a combination of five key constraints, four of which are technical. (Other non-technical constraints such as literacy, culture, and language, are not covered here). Depending on the target area, none or all of these may apply. I consider these issues to be as follows.

MOBILE OWNERSHIP

Although growing at a phenomenal rate, mobile ownership in many developing countries is still relatively low, and nowhere close to the near 100 percent penetration rates that we see in many mature markets. If educational establishments begin to embrace mobile technology to any significant extent, then issues of ownership and access to handsets by students need to be addressed to ensure that, in the words of a recent American president, "no child is left behind". Putting learning tools in the hands of children in developing countries is a key objective of MIT's One Laptop Per Child project. Many people believe that the mobile phone would be a better tool to work with. The debate continues.

MOBILE TECHNOLOGY

Where pupils do own, or have access to, mobile phones, more often than not—and this is particularly the case in many rural areas—these phones will be either older models, or lower-end handsets with limited functionality. In order to develop appropriate teaching tools, the reality of the target market needs to be considered. The wider community should most likely consider ownership and use of PDAs and Pocket PCs as non-existent.

NETWORK ACCESS

Higher-end handsets with data capability are only useful in areas where the mobile network can service them, and where costs of data access are not prohibitive. In many cases neither of these are a safe bet. By way of an example, during a recent one-month visit to Uganda working with Grameen, I was able to connect to the Internet using my phone approximately 10 percent of the time.

DEVICE LIMITATIONS AND LACK OF INDUSTRY STANDARDS

Mobile phones may be ubiquitous, highly portable, shareable, immediate, and always-on, but there also limitations that challenge even the most talented mobile applications developers—small (and generally low-resolution) displays, awkward text input methods, slow data access (if at all), and issues of battery life, among others. On top of all that, the mobile industry has historically suffered from a lack of standards, with different manufacturers supporting different video and audio formats, no standard screen size and resolution, lack of regular support for Java and/or Flash, incompatible browsers (if at all), and a wide array of memory sizes. All of this fragments the platform landscape, making developing an m-learning application a real challenge.

"A project is complete when it starts working for you, rather than you working for it". – Scott Allen

Summary

Despite these issues, however, there is still much that can be done. Text messaging, or SMS, is universally available to mobile owners the world over, and it is relatively cheap, direct, and gets around many issues of literacy. Although based more in the administrative side of education, a number of African countries allow students to obtain their exam results by SMS or check whether they have successfully enrolled in a course.

In 2005, the University of Cape Town piloted the use of mobile phones to help administer a number of their courses. Text messages were sent out to students whenever re-scheduling and cancelling of classes was necessary, whenever there were computer network problems, and when test results became available. According to a spokesperson at the University, "At a superficial glance, with its concentration on administrative functions, the project does not seem remarkable, particularly as the developed world moves into sophisticated m-learning. The importance of the project, however, is that it illustrates a set of principles useful for the introduction of this technology into the third-world environment, or into any institution making first steps into m-learning".

In other African countries SMS is being used to alert parents if their children haven't turned up for school or by children who find themselves the victim of bullying. During an online discussion towards the end of 2007 about the potential of mobile technology in e-learning, a number of initiatives were discussed, including the texting of homework to students, or the ability for students to text in their homework answers, or for SMS to be used as a reading aid. With some children living far away from their nearest school, such initiatives could be revolutionary. And with products such as FrontlineSMS, implementing such projects need not be expensive or technically out of reach. Today such talk is still more about blue sky thinking than the sky being the limit. But it will not always be this way.

Ironically, technological conditions aside, m-learning is particularly well suited for use in developing countries. M-learning is useful as an alternative to books or computers, which are generally in short supply. It is empowering in situations where students are geographically dispersed, again a common scenario, and it is particularly helpful in getting students up to speed who may have previously felt excluded or who find themselves falling behind and need to catch up quickly.

Mobile technology has revolutionized many aspects of life in the developing world. The number of mobile connections has almost overtaken the number of fixed-lines in most developing countries. Recent research by the London Business School found that mobile penetration has a strong impact on GDP. For many people, their first-ever telephone call will be on a mobile device. Perhaps, sometime soon, their first geography lesson will be on one, too.

Further information on Ken's work can be found at http://www.kiwanja.net—"Where technology meets anthropology, conservation and development."

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6
The Impact of Technology on Education

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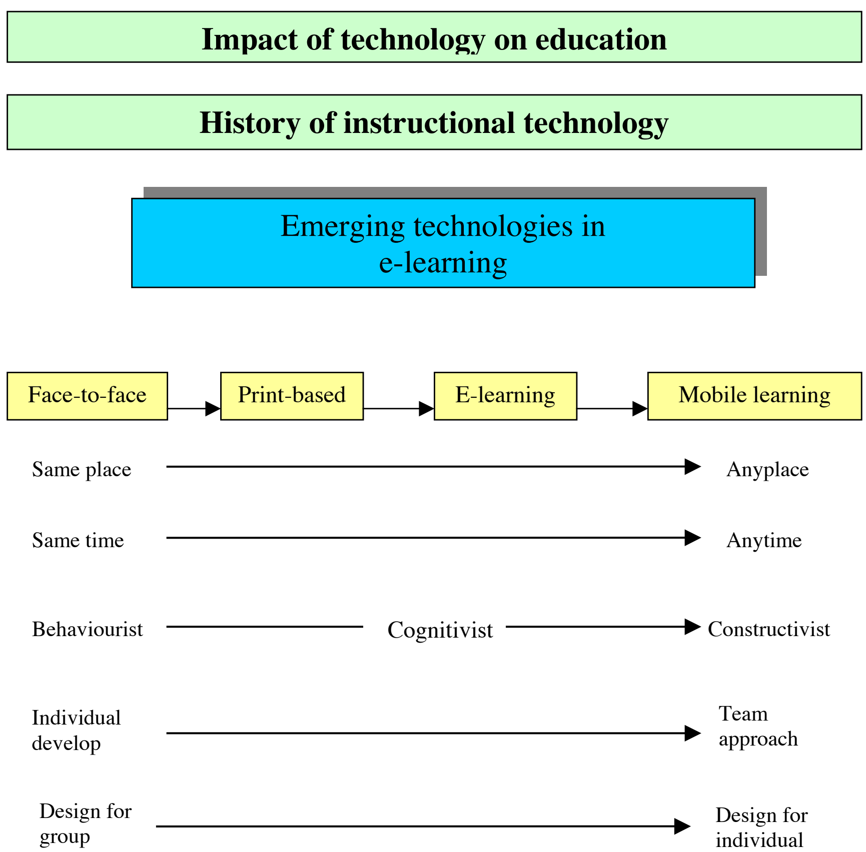
If we value independence, if we are disturbed by the growing conformity of knowledge, of values, of attitudes, which our present system induces, then we may wish to set up conditions of learning which make for uniqueness, for self-direction, and for self-initiated learning. – Carl Rogers



Learning outcomes

After completing this chapter, you should be able to:

- Trace the history of instructional technologies in education.
- Select the best emerging technologies in **e-learning**.
- Develop design guidelines for learning materials to be delivered via emerging technologies.
- Provide support for learners taking courses at a distance using emerging technologies.
- Identify trends in e-learning and emerging technologies.

Introduction

Learners. educators, and workers in all sectors are increasingly using **emerging technologies** such as cell phones, tablet PC, personal digital assistants (PDAs), web pads, and palmtop computers. As a result, these tools make learning and **training** materials accessible anywhere, anytime.

Today, the trend is towards learning and working "on the go", rather than having to be at a specific location at a specific time. As learners become more mobile, they are demanding access to learning materials wherever they are and whenever they need them. This trend will increase because of **ubiquitous computing,** where computing devices, wireless connectivity, and transparent user interfaces are everywhere.

Educators must be prepared to design and deliver instruction using these emerging technologies. In addition to delivering learning materials, emerging technologies can be used to interact with learners, especially those who live in remote locations. At the same time, learners can use the technologies to connect with each other to collaborate on projects and to debate and discuss ideas.

This chapter provides a brief history of technology in education, outlines the benefits of using emerging technologies in e-learning, provides design guidelines for developing learning materials, describes the support required for these technologies, and discusses future trends in e-learning.

The history of instructional technology in education

In the early ages, before formal schools, family members educated younger members with one-to-one coaching and **mentoring.** Early instructional technologies were sticks to draw on the ground and rocks to draw on walls. Information was not recorded permanently. With the invention of paper and the printing press, information was recorded, and learners could refer to documents as needed for learning. The paper revolution was followed much later by the invention of computer hardware and the software that makes computers do what we want, including developing electronic learning materials.

In the early 1960s, these learning materials were designed and developed on mainframe computers. In the 1970s, **computer-based** training systems used minicomputers to teach. With the invention of the microcomputer in the late 1970s and early 1980s educators and learners had more control over the design and delivery of learning materials. As learners determined for themselves what they wanted to learn, the instructor's role changed from that of a presenter of information to that of a facilitator. The microcomputer revolutionized the way educational materials were developed and delivered. The instructor was able to design learning materials using authoring systems, and learners were able to learn when and where they wanted.

Rumble (2003) identified four generations of distance education systems: correspondence systems; educational broadcasting systems; **multimedia** distance education systems; and online distance education systems. In early distance education learning materials were mailed to learners and the learners mailed assignments back to the instructor. The first attempt to use computers for instruction was by the military, who designed instruction to train military staff. About the same time, educational institutions started to use broadcast television to deliver instruction to learners. With the invention of the microcomputer in the 1970s, there was a shift to microcomputer-based learning systems. Because the different microcomputer systems then in use did not communicate with each other, there was limited flexibility in developing and sharing learning materials. Also, the early microcomputer systems did not provide features such as audio, video, and special effects. As instructional technology improved, educators developed learning materials in less time and with more control over the product.

Until the late 1970s, educational institutions used face-to-face classroom instruction. This was followed by a shift to a more individualized format using self-study workbooks, videotapes, and computer software. As technology advanced, the group-based classroom mode shifted to the one-to-one mode of delivery. The combination of the Internet and mobile technology has moved e-learning to the next generation, allowing educators to design and deliver learning materials for learners living in remote locations, or who cannot attend face-to-face schools for other reasons. The available computing power of these technologies allows educators to better meet the needs of individual learners.

Benefits of using emerging technologies in e-learning

Because of the rapid development of information technology, there is a shift from print-based learning to e-learning to **mobile learning** (m-learning). M-learning refers to the use of electronic learning materials with built-in learning strategies for delivery on **mobile computing devices** (Ally, 2004a). Mobile devices offer many benefits. Thanks to wireless technology, mobile devices do not have to be physically connected to networks to access information. They are small enough to be portable, allowing users to take the devices anywhere. Users can interact with each other to share information and expertise, complete a task, or work collaboratively on a project.

Benefits of emerging technologies for education:

- Education is scaleable, since educational institutions do not have to build classrooms and infrastructure to hold face-to-face classes. To accommodate more learners, educational institutions need only expand the network and hire more instructors to facilitate additional courses.
- Electronic learning materials are easy to update. Because learners use their mobile devices to access the learning materials from a central server, they can receive these updates as soon as they are made.
- The same learning materials can be accessed by students from different regions and countries.
- Learners can complete their education from any location as long as they have access to the learning materials, possibly through a wireless connection.
- Because learners can access the learning materials anytime, they can select the time they learn best to complete their coursework. This increases the success rate in learning, and facilitates informal learning.
- Designers of learning materials for emerging technologies can leverage the computing power of the technology to personalize the learning experience for individual learners.
- Since learning with emerging technologies is learner-focused, learners will be more involved with their learning, and thus motivated to achieve higher level learning.
- For businesses, mobile learning can be integrated into everyday work processes, which promotes immediate application. The emerging technologies allow workers to access learning materials for **just-in-time** training.
- Because most learners already have mobile technology, educational institutions can design and deliver courses for different types of mobile technology (Ally & Lin, 2005).

Mobile technologies such as Blackberries, Treos, iPods, and cell phones are being used in the classroom and in distance education to reach out to students and to deliver learning materials to students. Instructors are taping their lectures and making them available for students to listen whenever they like. Providing lectures and learning materials in audio format is important for some subject areas such as when learning a language and English Literature. The mobile technologies are also used to connect to students to inform them when course requirements are due and informing them on updates to courses. Mobile learning technologies can be used in any discipline that can be broken down into small segments of instruction. This will allow students to complete one segment at a time. In addition to playing a support role in classroom instruction, mobile technologies can play a major role in distance education by delivering instruction anywhere and at anytime. Books and course information will have to be formatted for reading on computer and mobile devices screens. A good example of how this is being realized is the screen on the one hundred dollar laptop (OLPC, 2006). Information on the screen can be read in daylight as well in the dark. The small screens on the mobile devices are becoming more advanced for reading. As with the development of the virtual screen, students will be able to project information and images on a surface that is the same size as a regular computer screen.

However, before these benefits can be realized, the learning materials must be designed specifically for emerging technologies.

Design principles for developing learning materials for emerging technologies

In developing learning materials for any technology, learning theories must be used for effective and efficient instruction. This section will address theories and design principles for emerging technologies.

Early learning materials development was influenced by **behaviourist learning theory**. Behaviourists claim that it is the observable behaviour of the learner that indicates whether or not they have learned, not what is going on in the learner's head. Early instructional methods, such as the teaching machine, were influenced by behaviourist theory. The teaching machine taught by drill and practice, and transferred the repetitiveness of teaching from the instructors to the machine.

Cognitive learning theory influenced the development of learning materials with the introduction of computer-based instruction. Cognitive psychologists see learning as a process involving the use of memory, motivation, and thinking, and that **reflection** plays an important part in learning. Cognitivists perceive learning as an internal process and claim that the amount learned depends on the processing capacity of the learner, the amount of effort expended during the learning process, the quality of the processing, and the learner's existing knowledge structure. Cognitive theory was influenced by information processing theory, which proposes that learners use different types of memory during learning.

As technology emerged, there was more emphasis on learner-centred education, which promoted the use of **constructivist theory** in the development of learning materials. Constructivists claimed that learners interpret information and the world according to their personal reality, and that they learn by observation, processing, and interpretation, and then personalize the information into their own worldview. Also, learners learn best when they can contextualize what they learn for immediate application and to acquire personal meaning. The learner-centred approach allows learners to develop problem-solving skills and learn by doing rather than by being told.

They are many **instructional design** models for developing learning materials. Dick et al. (2001) proposed a design model with the major components being design, development, implementation, and evaluation of instruction. Another widely used model is by Gagné et al. (1991) who claimed that strategies for **learning** should be based on learning outcomes. Gagné specifies nine types of instructional events:

- gain the learner's attention;
- inform the learner of the lesson objectives;
- stimulate recall of prior knowledge;
- present stimuli with distinctive features to aid in perception;
- guide learning to promote semantic encoding;
- elicit performance;
- provide informative feedback;
- assess performance; and
- enhance retention and learning transfer.

Most of the current and past instructional design models were developed for classroom and print-based instruction rather than for learner-centred instruction and e-learning. New instructional design models are needed to develop learning materials for delivery on emerging technologies.

According to Jacobs and Dempsey (2002), some emerging influences that will affect future instructional design include object-oriented distributed learning environments, the use of **artificial intelligence** techniques, cognitive science, and neuroscience. Below are guidelines for educators to develop learning materials for delivery via emerging technologies.

TIPS AND GUIDELINES

- Information should be developed in "chunks" to facilitate processing in **working memory** since humans have limited working memory capacity. Chunking is important for mobile technologies that have small display screens, such as cell phones, PDAs, etc.
- Content should be broken down into **learning objects** to allow learners to access segments of learning materials to meet their learning needs. A learning object is defined as any digital resource that can be re-used to achieve a specific learning outcome (Ally, 2004b). Learning materials for emerging technologies should be developed in the form of **information objects**, which are then assembled to form learning objects for lessons. A learning session using a mobile device can be seen as consisting of a number of information objects sequenced in a pre-determined way, or sequenced, according to the user's needs. The learning object approach is helpful where learners will access learning materials just in time, as they complete projects using a self-directed, experiential approach. Also, learning objects allow for instant assembly of learning materials by learners and by intelligent software agents to meet learners' needs.
- Use the constructivist approach to learning to allow learners to explore and personalize the materials during the learning process. Learning should be project-based to allow learners to experience the world by doing things, rather than passively receiving information, to build things, to think critically, and to develop problem-solving skills (Page, 2006). Mobile technologies facilitate project-based learning since learners can learn in their own time and in their own

environments. For example, as learners complete a project they can use wireless mobile technology to access just in time information and the instructor as needed.

- Simple **interfaces** prevent cognitive overload. For example, graphic outlines can be used as interfaces and as navigational tools for learners. The interface should allow the learner to access learning materials with minimal effort and navigate with ease. This is critical for emerging technologies since some output devices are small.
- Use active learning strategies that allow learners to summarize what they learn and to develop critical thinking skills. For example, learners can be asked to generate a **concept map** to summarize what they learned. A concept map or a **network diagram** can show the important concepts in a lesson and the relationship between them. Learner-generated concept maps allow learners to process information at a high level. High-level concept maps and networks can represent information spatially, so learners can see the main ideas and their relationships.
- Learning materials should be presented so that information can be transferred from the senses to the sensory store, and then to working memory. The amount of information transferred to working memory depends on the importance assigned to the incoming information and whether existing cognitive structures can make sense of the information. Strategies that check whether learners have the appropriate existing cognitive structures to process the information should be used in emerging technologies delivery. Pre-instructional strategies, such as **advance organizers** and overviews, should be used if relevant cognitive structures do not exist.
- There should be a variety of learning strategies to accommodate individual differences. Different learners will perceive, interact with, and respond to the learning environment in different ways, based on their **learning styles** (Kolb, 1984).

According to Kolb, there are four learning style types:

(1) Divergers are learners who have good people skills. When working in groups, they try to cultivate harmony to assure that everyone works together smoothly.
(2) Assimilators like to work with details, and are reflective and relatively passive during the learning process.
(3) Convergers prefer to experiment with, and apply new knowledge and skills, often by trial and error.
(4) Accommodators are risk-takers, who want to apply immediately what they learn to real-life problems or situations.

Examples of strategies to cater for individual learning preferences include:

- Use visuals at the start of a lesson to present the big picture, before going into the details of the information.
- For the active learners, strategies should provide the opportunity to immediately apply the knowledge.
- To encourage creativity, there must be opportunities to apply what was learned in real-life situations so that learners can go beyond what was presented.
- The use of emerging technologies will make it easier to cater to learners' individual differences by determining preferences, and using the appropriate learning strategy based on those preferences.
- Provide learners the opportunity to use their **metacognitive** skills during the learning process. Metacognition is a learner's ability to be aware of their cognitive capabilities and to use these capabilities to learn. This is critical in e-learning, since learners will complete the learning materials individually. Exercises with feedback throughout a lesson are good strategies to allow learners to check their progress, and to adjust their learning approach as necessary.
- Learners should be allowed to construct knowledge, rather than passively receive knowledge through instruction. Constructivists view learning as the result of mental construction where learners learn by integrating new information with what they already know.
- Learners should be given the opportunity to reflect on what they are learning and to internalize the information. There should be embedded questions throughout the learning session to encourage learners to reflect on, and process the information in a relevant and meaningful manner. Learners can be asked to generate a journal to encourage reflection and processing. Interactive learning promotes higher-level learning and social presence, and personal meaning (Heinich et al., 2002).

Intelligent agents should be embedded in the technology to design instruction and deliver the instruction based on individual learner needs. An intelligent agent gathers information about learners and them respond based on the what was learned about the student. For example, if a learner consistently gets a question on a concept wrong, the intelligent agent will prescribe other learning strategies until the learner master the concept. As the user interacts with the system, the agent learns more about the learner. This is critical, as learning materials may be accessed by people globally. These agents can be proactive so that they can recognize and react to changes in the learning process. As the intelligent agent interacts with the learner, it gains more experience by learning about the learner and then determining the difficulty of materials to present, the most appropriate learning strategy based on the learner's style, and the sequence of the instruction (Ally, 2002). The intelligent learning system should reason about a learner's knowledge, monitor progress, and adapt the teaching strategy to individual's learning pattern (Woolf, 1987). For example, the intelligent system could monitor learning and build a best practice database for different learning styles. It could also track common errors and prescribe strategies to prevent similar errors in the future.

Planning for implementing emerging technologies in e-learning

Good planning and management are necessary for developing and delivering successful learning materials. E-learning development projects tend to be interdisciplinary, requiring a team effort. No one person has the expertise to complete the development project. The different types of expertise required include subject matter, technical support, instructional design, project management, multimedia, and editing. Educational organizations should be thinking long-term and, strategically, to make sure that learning systems are aligned with the goals of the institution.

Some of the factors that lead to successful e-learning follow.

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- Involve key players form the start of the project. One group that should be involved are instructors who may be developers or reviewers of the learning materials.
- Inform stakeholders of the progress so that they will continue to fund the project.
- Determine team members' roles and responsibilities so that they can be productive and cooperative.
- Involve all team members in the project, with team members interacting with each other.
- Keep learners' needs foremost in mind during the development of learning materials.
- Establish standards of quality control and quality assurance to ensure the learning materials are of high quality.
- Assess skills and expertise of team members, and provide the appropriate **training** if needed.
- Start with a small project to build success before moving on to larger projects.
- Ensure proper support during the implementation of the learning systems.
- Maintain the learning materials to ensure they are current, and address any problems with the delivery system.

Providing support in e-learning using emerging technologies

When instruction is delivered to learners at a distance, learners must have adequate support to be successful. Instructor can use **synchronous** or **asynchronous communication** tools to communicate and interact with learners. In synchronous learning, support is provided in real time, using two-way text, audio, and/or video. The learner and the instructor are able to interact with each other synchronously. In the asynchronous mode, there is a delay in communication between the instructor and learner. For example, in computer conferencing learners post their comments in real time while other learners and the instructor may respond at a later time. Hence, as instructors move from face-to-face delivery to **e-learning**, their roles change drastically, shifting from that of dominant, front-of-the-class presenter to facilitator, providing one-to-one coaching to learners, and supporting and advising them. Since the learner and instructor are not physically present in the same location, the instructor has to use strategies to compensate for the lack of face-to-face contact.

How should the instructor function in the e-learning environment? In a study conducted by Irani (2001), faculty suggested that training for online delivery should include instructional design, technology use, and software use. Keeton (2004), reported that the areas faculty see as important for e-learning are those that focus on the learning processes. The instructor should be prepared both to facilitate and to provide support for learning.

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- Instructors must be trained to be good facilitators of e-learning. The instructor has to facilitate learning by modelling behaviour and attitudes that promote learning, encourage dialogue, and demonstrate appropriate interpersonal skills. Good facilitation skills are important to compensate for the lack of face-to-face contact in e-learning and to connect to the learner and create a high sense of presence (Hiss, 2000).

- The instructor should be trained to recognize different learning styles and adapt to them. An effective e-learning instructor must recognize that learners have different styles and prefer certain strategies (Ally & Fahy, 2002).
- The e-learning instructor should understand the importance of feedback, and be able to provide effective, constructive, and timely feedback to learners (Bischoff, 2000). Learners should feel comfortable and motivated by the instructor's enthusiasm about the course materials. Learners can be motivated by challenging them with additional learning activities, and by emphasizing the benefits of what they are learning.
- The e-learning instructor must be able to advise learners when they encounter academic and personal problems during their studies. The instructor has to acknowledge the problems and, in some cases, address them. For personal problems, the learner should be referred to a professional counselor. One of the key competencies for training instructors is deciding when to help a learner with a problem and when to refer the learner for professional help.
- The e-learning instructor must interpret learners' academic problems and provide resolutions. This implies that the instructor has the expertise to solve content problems. The instructor solves these problems by staying current in the field, interpreting learners' questions, communicating at the level of the learner, providing remedial activities, and following up on help provided. Interaction with learners requires good oral and written communication skills. E-learning instructors are required to develop and revise courses on an ongoing basis. Part of the tutoring process is to provide written feedback. The instructor needs good listening skills to understand what the learner is saying in order to respond appropriately. A training program for e-learning instructors must include effective listening skills. As part of the tutoring and coaching process, the instructor needs to know how to ask questions to elicit information from learners and to diagnose their problems.
- Instructors must be trained in using e-learning technologies to develop and deliver learning materials. This is critical, as the instructor must model proper use of the technologies for the learners. Instructors should be patient, project a positive image, enjoy working with learners, and be a good role model.

With learners at a distance, some in remote locations, one way to connect them is to use of online discussion forums.

GUIDELINES FOR MODERATING ONLINE DISCUSSIONS IN E-LEARNING

Well-moderated discussion sessions allow learners to feel a sense of community and to develop their knowledge and skills in the subject area. The moderator should have good written and oral communication skills, be a good facilitator, be able to resolve conflict, and should be an expert in the subject field. Below are some specific guidelines for moderating online discussion forums using emerging technologies.

- Welcome the learners to the forum, and invite them to get to know each other.
- Provide appropriate feedback to forum postings. Learners expect the instructor to be subject matter experts, and to provide feedback on their comments and questions on the course content. Foster dialogue and trust with comments that are conversational.
- Build group rapport by encouraging learners to share ideas and help each other. Learners could, perhaps, form small groups to address certain issues and report back to the larger group.
- Respond to learners' questions promptly. In synchronous conferencing, learners will see or hear the responses right away. In asynchronous computer conferencing, as a guideline, the instructor should post responses to questions within twenty-four hours.
- Set the tone of the discussion. Providing sample comments is helpful for new learners to model their own comments. Keep the forum discussion on topic. Some learners might stray off topic during the discussion. If learners want to discuss another topic, create another forum where participation is voluntary. If a learner continually stays off topic, the instructor should consult with the learner individually.

Emerging trends in the use of emerging technologies in e-learning

Educators need to develop innovative models of teaching and delivery methods tailored to emerging technologies. Future learning systems should contain intelligent agents to duplicate one-to-one tutoring. Multiple intelligent agents could also monitor learners' progress, and cater to individual needs and styles. Intelligent learning systems will allow learners to be more active and will place more responsibility on them in the learning process. Research is needed on how to empower learners to learn on their own and how to activate learners' metacognitive skills.

Content will be designed as small chunks in the form of information and learning objects. This will allow intelligent agents to prescribe the most appropriate materials based on learner's learning style, progress, and needs. The intelligent agents will assemble these chunks into a larger instructional sequence so that learners can achieve the learning outcomes of the lesson. More work is needed on how to develop learning objects and how to tag them for easy retrieval by intelligent agents.

Future technologies will use intelligent agents to assemble courses and modules of instruction immediately by accessing learning objects from repositories. Because of the changing nature of content, models are needed to develop learning materials in as short time as possible using techniques similar to **rapid application development** (Lohr et al., 2003). Smart learning systems in emerging technologies will be able to assemble unique courses for each learner, based on the learner's prior knowledge, learning preferences, and needs.

Pervasive computing is making it possible for computing power to be included everywhere, thanks to tiny microprocessors and wireless access. As a result, educators must design for pervasive computing where learners will access learning materials using everyday objects and environments. For example, learners might be able to access course materials using kitchen appliances, or their clothing.

The trend in hardware development is towards virtual devices, such as the virtual keyboard and virtual screen. With these devices, learners are able to turn on the device, use it, and then turn it off. For example, for input into a computer, a learner can press a button to turn on a virtual keyboard on a temporary surface, use it, then turn it off. When developing learning materials for emerging technologies, educators must design for delivery on these virtual devices.

Summary

As we continue to use such technologies as cell phones, PDAs, palmtops, and virtual devices for everyday activities, educators will need to develop and deliver learning materials on these devices. Educators must proactively influence the design and development of emerging technologies to meet learners' needs. A good example of this is the one hundred dollar laptop that is being developed by a multidisciplinary team of experts, including educators (OLPC, 2006). The one hundred dollar computer is a global device that will be used by learners around the world since it is affordable.

E-learning materials must be modular to allow for flexibility in delivery. Modular learning materials allow learners to complete a module of instruction at a time rather than an entire course. The learning time for a module of instruction is between two to four hours. The content must be broken down into small chunks and developed as learning objects. The modular format allows the segments of instruction to be tagged and placed in learning object repositories for easy retrieval by learners and instructors. When designing learning materials for emerging technologies, educators must think globally and must design for the future so that the materials do not become obsolete.

Learning systems of the future must develop intelligent systems to relieve tutors from routine decision-making so that they can spend time on issues concerning the learning process. Intelligent systems will be able to design, develop, and deliver instruction to meet learners' needs. For example, an intelligent agent will be able to identify learners who need extra help and provide an alternative learning strategy. The intelligent agent should anticipate learners' requirements and respond immediately to take corrective action or to present the next learning intervention based on learners' characteristics and style to maximize learning benefits. In other words, the intelligent agent should form dynamic profiles of the learner and guide the learner to the next step in the learning process.

One of the major challenges educators will face is how to convert existing learning materials for delivery on emerging technologies rather than redeveloping courses from scratch. It is important to develop learning materials in electronic format so that the information can readily delivered by newer technologies.

> "Real learning occurs when learners learn by doing and making things". – Ally

Glossary

Advance organizer. A general statement at the beginning of the information or lesson to activate existing cognitive structure or to provide the appropriate cognitive structure to learn the details in the information or the lesson.

Artificial intelligence. The use of computer systems, software and models to imitate human thought and reasoning when completing a task.

Asynchronous communication. Information sharing and interaction between individuals take place at different times, as in sending emails, where messages are sent and then read at a later time.

Behaviourist learning theory. Views learning as a change in behaviour, and explains learner behaviour in terms of external physical stimuli and responses, rather than what the learner is thinking.

Cognitivist learning theory. Focuses on what a learner is thinking in terms of processing information for storage and retrieval.

Computer-based training. Use of a computer to deliver instructions to learners using a variety of instructional strategies to meet individual learners' needs.

Concept map. A graphic outline that shows the main concepts in the information and the relationship between the concepts.

Constructivist theory. Knowledge is constructed by the learner through experiential learning and interactions with the environment and the learner's personal workspace.

E-learning. Learning that takes place off-site using a variety of delivery technologies such as, Internet and mobile devices. Learners can access the material anywhere, and at anytime.

Emerging technologies. Technologies that are becoming ubiquitous, and use the power of the computer to design, deliver, and provide support to learners with different needs.

Information object. Digital information stored in chunks in a digital repository and tagged for retrieval to meet users' information needs.

Instructional design. A systematic approach to designing learning materials based on learning theories and research.

Intelligent agent. Computer software that gathers information and adapts to the user's needs to help the user complete a specific task. As the user interacts with the system, the agent learns more about the learner.

Interface. The components of the computer program that allow the user to interact with the information.

Just-in-time. The opportunity to access learning materials as required for immediate application.

Learning object. Any digital resource that can be used and re-used to achieve a specific learning outcome.

Learning style. A person's preferred way to learn and process information, interact with others, and complete learning tasks.

Mentoring. A mentor and learner relationship where the mentor serves as a role model and instructor for the learner to model and learn from during the learning process.

Metacognitive skills. Learners use their metacognitive skills to assess their level of achievement, determine alternate strategies, select the most appropriate strategy, and then re-assess the level of achievement.

Mobile computing device. A portable device that can be used to access information and learning materials from anywhere and at anytime. The device consists of an input mechanism, processing capability, a storage medium, and a display mechanism.

Mobile learning (m-learning). Electronic learning materials with built-in learning strategies for delivery on mobile computing devices.

Multimedia. A combination of two or more media used to present information to users.

Network diagram. A diagram that shows the relationship between concepts. The concepts are shown as nodes with interconnecting lines.

Online learning. Use of the Internet to deliver instruction to learners using a variety of instructional strategies.

Pervasive computing. Use of computer devices to access information from interconnected networks using wireless technology.

Rapid application development. A process that uses a team of experts to develop learning materials in a short time.

Reflection. The ability to encounter information and make it part of one's existing cognitive structure. Reflection results in the creation of knowledge.

Support. The use of synchronous and asynchronous technology by a tutor to interact with learners at a distance.

Synchronous communication. Interaction between individuals where information is sent and received at the same time as in audio conferencing or online chat.

Training. The process by which individuals acquire knowledge, attitudes, and skills to perform specific tasks.

Ubiquitous computing. Computing technology that is invisible to the user because of wireless connectivity and transparent user interface.

Working memory. The place where information is processed before being transferred to long-term memory. The brevity of short-term memory requires information to be processed efficiently before being transferred to long-term memory.

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Part 2: Preparing Online Courses

7
Learning Management Systems

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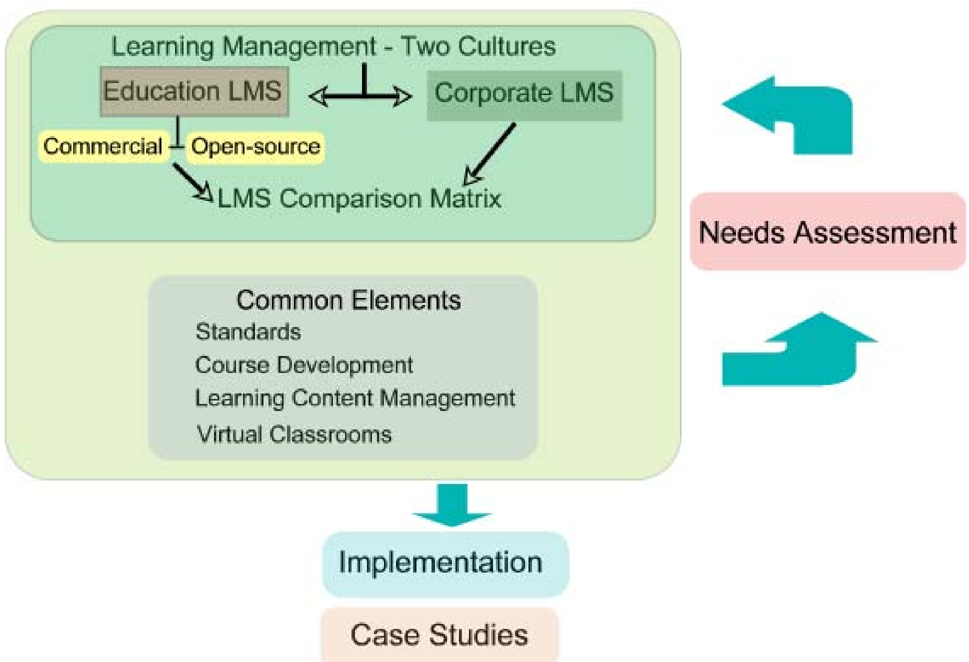

[7] With contributions from Kevin Kelly and Randy Labonte

Learning outcomes

After completing this chapter, you should be able to:

- Describe the functions of learning management systems (LMS) for formal education and corporate training.
- Conduct a needs analysis, select an appropriate LMS for your environment and manage the implementation and change process successfully at least 50 percent of the time. A higher success rate will depend upon the political environment and the diligence of the needs analysis and research that is done.

Introduction

> "I truly believe that the Internet and education are the two great equalizers in life, leveling the playing field for people, companies, and countries worldwide. By providing greater access to educational opportunities through the Internet, students are able to learn more. Workers have greater access to **e-learning** opportunities to enhance and increase their skills. And companies and schools can decrease costs by utilizing technology for greater productivity". – John Chambers, CEO of Cisco Systems (Chambers, 2002)

WHAT ARE LEARNING MANAGEMENT SYSTEMS?

Learning management systems (LMSs) are electronic platforms that can be used to launch and track e-learning courses and enhance face-to-face instruction with online components. Some also manage classroom instruction. Primarily they automate the administration of learning by facilitating and then recording learner activity. They may or may not include tools for creating and managing course content. As the systems grow, they also add new features such as **e-commerce**, communications tools, skills tracking, **performance management** and **talent management.**

LMSs have evolved quite differently for formal education and corporate training to meet different needs. The most common systems used in education are WebCT, Blackboard (these are now effectively one) and Moodle. They often use the term **course management system** to describe themselves. The term course management system, however, is easily confused with **content management system,** so we will use the term LMS to describe the solutions for both educational and corporate environments. We will distinguish between them by discussing corporate or business LMS versus education LMS. Education LMSs are also known as **virtual learning environments** (VLE).

This chapter will be a non-technical look at the features of these systems and the processes of selecting and implementing them. It will address the different functionalities of the systems and consider **open-source** systems as an option to commercial proprietary ones. It will discuss needs analysis to help you begin the process of selecting an appropriate system, and the change management process to address the implementation issues. Case studies will be provided for illustration. Open source systems will be discussed in Chapter 8, Exploring Open Source for Educators.

Occasionally certain vendors and products or services are mentioned by name. These are not intended to be endorsements in any way but simply to serve as familiar examples. We do not endorse any products or services. Vendors and products that are mentioned are usually the best known or the ones with the greatest market penetration. There is no single "best" solution. The ideal solution is the one that fits your needs and environment.

Learning management: the two cultures

There are two main thrusts in formal learning: academic education, and corporate training (including government and the non-profit sector). In educational institutions, the learning model uses courses of fairly long duration (weeks to months) for the long-term educational benefit of the learner. In corporate training, the model is usually short courses (hours to days) for immediate updates, with specific focus on job functions and objectives. Some corporations try to emphasize the importance of their training services by calling them "universities" such as McDonald's University and General Motors University. As part of their long-term development plans, many businesses also provide support for their employees to attend educational institutions for longer courses and degree programs. For centuries, both systems have relied upon classroom-based, instructor-led facilitation in which a live teacher leads the process.

Distance learning by correspondence has been with us now for many decades. When e-learning became a reality over 10 years ago (first on CD-ROM and then over the Internet), it extended the opportunities for distance learning, and new options and models became possible. The education and corporate training models have evolved separately and somewhat differently.

In the online education environment, it is generally assumed that an instructor leads the course, is available by chat (**synchronous**), via email and discussion groups (**asynchronous**), and sometimes via **virtual classrooms**. In the corporate online learning environment, there is a high degree of dependence on **self-directed** learning often using courses that have been purchased off-the-shelf from third-party vendors. Only occasionally is an instructor present. As a result, the communication/collaboration tools for email, chat, and group activity are well developed in education LMSs while they are less so in corporate LMSs.

Education LMSs are primarily for the delivery of instructor designed online learning and include course content creation (or course authoring) capability as well as some tools to manage the content. While corporate LMSs provide features to help manage classroom instruction, the e-learning is often assumed to be primarily asynchronous, self-directed courses. Many of these courses are purchased from off-the-shelf courseware vendors. As a result, corporate LMSs do not typically include course authoring or content management features. The larger corporate vendors do often offer suites of tools that do include these capabilities.

In most educational institutions, computer systems for registration already exist, so the features for this in education LMSs are limited while many corporate LMSs offer full capabilities for managing classroom learning from registration to assessment as well as e-learning. It is highly desirable that in an educational institution, the LMS can send data to and from the registration system, and in corporate training the LMS can communicate with the human resources information system.

The focus of both education and corporate LMSs often tends to be more on the administration and technical requirements of the organization rather than on the dynamic facilitation of learning. Some instructors and designers are frustrated by the constraints (both technical and learning) of using these systems and would prefer more dynamic learning support systems such as student **weblogs** and learning **wikis**. (See Chapters 25 and 26 for further discussion of these tools). Some of the open-source systems, especially when combined with social learning tools, are more student-centred than the commercial ones.

Online and classroom learning each offer different advantages for different learners. Many people argue that classroom learning is better. Some believe that the classroom offers interactivity—a dynamic exchange of information, questions and opinions between students and instructor and among students. Unfortunately interactivity in a classroom often involves a minority of students who choose to participate, and for others it may not be interactive at all. We have been conditioned since the age of five to believe that learning only happens in a classroom. The reality is that we are continuously learning in all situations. One benefit of the classroom is the social structure and support of schedule, deadlines, the physical presence of the instructor, and other learners. Self-directed online courses offer the obvious advantages of time flexibility—they can be done almost anywhere and at anytime at the convenience of the learner, and they can be repeated several times if necessary. Well-designed online courses can be more effectively interactive than many classrooms in that they require active learning on the part of each student in responding to questions, doing an activity, getting feedback—there is no back of the classroom in an online course—and give them the added flexibility of the freedom from time and place constraints.

Tip

There are at least 100 LMSs available for business and at least 50 available for education. Many of the latter are open-source. Although they offer different features, it is best not to ignore the LMSs from the other sector.

Features of education learning management systems

The original educational learning management system was probably PLATO, which was developed in the early 1960s. In the late 1970s there were initiatives like the Open University in the UK Cyclops system and CICERO project, Pathlore's Phoenix software, and Canada's Telidon project. Wikipedia has an extensive listing of initiatives in its article, History of Virtual Learning Environments.

In formal education LMSs were first used to support distance education programs by providing an alternative delivery system. They are also now used as platforms to provide online resources to supplement regular course material and to provide courses for students who require additional flexibility in their schedules, allowing them to take courses during semesters when they are not physically present or are not attending on full time basis. This also benefits students who are disabled or ill and unable to attend regular classes.

Education LMSs primarily support e-learning initiatives only. Systems for regular classroom support are already in place.

The model for an LMS designed for education is that an instructor creates a course using web-based tools to upload the necessary materials for the students, and sets up collaborative tools such as:

- email
- text chat
- bulletin board presentation tools (e.g., a whiteboard for collaborative drawing and sketching)
- group web page publishing

Students access the course materials on the Web, do both individual and collaborative assignments, and submit them to the instructor.

Most education LMSs offer the following features:

Tools for instructors:

- course development tools—a web platform for uploading resources (text, multimedia materials, simulation programs, etc.), including calendar, course announcements, glossary, and indexing tools
- course syllabus development tools with the ability to structure learning units
- quiz/survey development tool for creating tests, course evaluation, etc.
- grade book
- administrative tools to track student activity both as individuals and in groups

Tools for students:

- password protected accounts for access to course materials
- course content bookmarking and annotation
- personal web page publishing
- accounts for access to the collaborative tools (email, discussion groups, collaborative web page publishing)
- access to grades and progress reports
- group work areas for collaborative web page publishing
- self-assessment tools

Administrative tools:

- management of student and instructor accounts and websites
- monitoring and reporting activity
- e-commerce tools for sale of courses
- communication and survey tools

Some may also offer, maybe at extra cost, some of the following features:

- **learning object** management (course content management for reusability)
- e-portfolios
- file and workflow management
- streaming audio and video
- access to electronic libraries

Blackboard now offers an e-commerce module, and Moodle integrates with PayPal to allow for customers to pay online.

Although LMSs often claim a learner-centred approach involving active collaboration between the instructor and students, both as individuals and in groups, there are some social networking tools such as wikis and weblogs (**blogs**) that most of these systems do not (as of this writing) support. There are numerous initiatives underway to develop add-on tools and to integrate social learning tools with open-source platforms.

In most cases it is assumed that the teacher provides the content, but some system vendors are now selling content as "e-Packs" or "cartridges" that can be uploaded by teachers. It is also possible to purchase course materials from other institutions. Using courses from other sources, however, may be challenging if they are not compatible with your LMS, consistent with the instructor's approach, or accessible by students with disabilities. This may improve with the development and application of operating and accessibility standards.

COMMERCIAL SYSTEMS

The most widely adopted commercial systems are WebCT and Blackboard. Web CT was originally developed by Murray Goldberg at the University of British Columbia, beginning in 1995. In 1999 the company was purchased by Universal Learning Technology of Boston, and became WebCT, Inc. Blackboard was originally developed at Cornell University. The company was founded in 1997 by Matthew Pittinsky and is based in Washington, DC. WebCT and Blackboard currently control about 80 percent of the LMS market in higher education (Sausner, 2005, p. 9). Blackboard purchased WebCT in 2005, making them the dominant force in the market. The WebCT products are currently being merged and re-branded as Blackboard products.

In August 2006, Blackboard received a controversial patent for certain features in its learning management technology, and, on the same day, proceeded to sue Desire2Learn (one of its main competitors) for patent infringement. Desire2Learn has denied the allegations in the law suit, and both Desire2Learn and the Software Freedom Law Center (SFLC) appealed the patent. In January, 2007 the United States Patent and Trademark

Office (USPTO) ordered re-examination of the patent. On February 1, 2007, Blackboard announced its patent pledge, which is a promise by the company to never assert its issued or pending course management system software patents against open-source software or home-grown course management systems.

It is hard to say what the effect of this will be on current and potential WebCT and Blackboard customers. Some will want to go with the market leader regardless, others will stay with what they have, and many may move to open-source solutions. Cornell University, the birthplace of Blackboard, is reconsidering whether Blackboard is the most appropriate software for Cornell professors and students.

Some other education oriented systems offered by commercial vendors:

- Desire2Learn
- eCollege
- Jenzabar
- Odyssey Learning Nautikos
- WBT Systems Top Class (now appears to be targeting the corporate sector)
- ANGEL
- Centrinity First Class (now a division of Open Text)
- Geometrix Training Partner (primarily a corporate LMS but often used by educational institutions for distance learning programs with a business orientation).

Notes:
- IBM/Lotus Learning Space no longer seems to be a viable contender in the education market. It is now called Workplace Collaborative Learning, and appears to be targeted to the business market.
- Prometheus has been purchased by Blackboard and no longer seems to be supported.

Tip

If you currently are using a commercial education LMS, you may find costs escalating, and a continual demand for upgrades. For these and other reasons, many educational institutions are considering open-source systems as an alternative.

OPEN-SOURCE SYSTEMS

Open-source software is computer software whose source code is available free "under a copyright license … that permits users to study, change, and improve the software, and to redistribute it in modified or unmodified form." (http://en.wikipedia.org/wiki/Open-source_software, February 2007). Open-source LMSs are gaining ground in the education market as a reaction to increasing costs for the commercial systems, and because of the greater flexibility and more student-centred learning approaches in the open-source systems. Some instructors, particularly those with technical expertise, will prefer these systems because of fewer constraints, a greater sense of control, and and generally better communication tools. Other instructors won't like them because they prefer more rule-based systems with full administrative features.

There are numerous open-source systems available. Some of the better known ones are:

- Moodle
- ATutor
- Sakai
- Bodington
- Claroline
- Magnolia

Although the software is free, open-source solutions are not without their costs. They need continuous support and maintenance, which require either a strong and supportive internal IT group, very dedicated instructors, or a contract with outside vendors who will do it for you. Open-source software is maintained by an active community of users who are constantly upgrading the code. These code changes can affect the operability of courses unexpectedly, and require more local maintenance. The "hidden" costs of the time of the IT people and the instructors may or may not outweigh the cost of a licence for a commercial system.

There are useful discussions of open-source systems at http://www.funnymonkey.com, http://openacademic.org/ and in Chapters 8 and 12 of this book.

OTHER ASPECTS OF LMSS

Some educational institutions have built their own LMS, and have not chosen to market them. Although it is possible for anyone to do the same, it is an expensive process, and it may be vulnerable if one person is the primary developer. Some of the open-source systems have been built by an institution or a group of institutions, and then shared. ATutor was developed at the University of Toronto. The Sakai initiative is a collective effort by 65 academic partners.

Course development: Course development tools (also called course-authoring tools) are an integral part of most education LMSs. Some instructors also like to use some of their own tools such as web authoring/HTML editors (e.g., Dreamweaver, FrontPage, GoLive), word processing (e.g., Microsoft Word) and presentation tools (e.g., Flash, PowerPoint). The LMS should be capable of working with such tools.

Virtual classrooms/web conferencing: Virtual classrooms (also known as web conferencing tools) add audio, video, and graphics to synchronous classes over the Internet. Such tools are not usually included as part of an LMS but are available separately.

Learning content management systems (LCMS) provide a means of storing developed courseware in learning repositories (databases) as learning objects where it can be retrieved and used by others. Most education LMSs have at least some learning content management capabilities.

Most LMSs are primarily administrative tools, and it is up to the instructors and designers developing the courses to address the issues of the learning model, but many of the LMSs lack the tools to support more student-centred learning. The integration of social learning tools such as wikis and blogs with an LMS can help create a more dynamic learning environment.

Social learning is closely related to social networking and social computing and is the essence of what is being called Web 2.0. It is the use of wikis, blogs, podcasting, etc., by individuals and groups to create content instead of simply being the recipients. Web 1.0 was about downloading; Web 2.0 is about uploading.

Web 2.0 is defined not only by technologies (blogs, wikis, podcasts, vodcasts, RSS feeds, and Google Maps are a few examples), but also by the social networking that it enables. Web 2.0 tools can scaffold learning environments for enhanced communication among students as well as between students and the instructor. Creating learning opportunities that harness the power of Web 2.0 technologies for collaborative learning, distributed knowledge sharing, and the creation of media-rich learning objects can further the scope of what students can learn by fostering a constructivist environment, and putting learning in the control of the students. Both students and instructors are embracing these tools at a phenomenal rate. Examples are Wikipedia and YouTube. LMSs will need to catch up.

Initiatives to include social learning into LMS include:

- Learning objects is a commercial product, and targets users of large-scale course management platforms.
- Elgg http://elgg.net/ (February 2007)—open-source
- Drupal http://drupal.org/ (February 2007)—open-source
- MediaWiki http://www.mediawiki.org/ (February 2007) —open-source

It is interesting to note that the University of Phoenix, one of the largest e-learning organizations in the world with nearly 200,000 students online simply uses *Outlook Express* newsgroups for its courses, along with other tools it has developed internally. Other early online universities like Pepperdine University use newsgroups extensively as well.

Tip
Adult and continuing education departments tend to follow more of a business model. If you are seeking an LMS for this application and need registration and payment features, consider some of the more reasonably priced business LMSs (see below).

Features of corporate learning management systems

The major business-oriented LMSs manage classroom and **blended learning** as well as e-learning, and are intended to function as the full registration systems for corporate training departments. Some of the larger ones such as SumTotal Systems, Saba and GeometrixTraining Partner actually evolved from registration systems. A few very basic corporate LMSs manage only e-learning, and then usually only for pre-packaged, self-directed courses.

Corporate LMSs usually offer the following features:

Classroom course management:

- registration
- course scheduling and set-up (instructors, facilities, equipment)
- email status notification
- tracking.

E-learning management:

- registration
- delivery
- email status notification
- tracking
- interoperability with third-party and custom courseware
- testing and evaluation
- communication tools.

Blended learning management combines e-learning course content with classroom activities and communication tools such as discussion groups and virtual classrooms.

Support for e-learning standards such as **AICC** (Aviation Industry Computer-based training Committee) and **SCORM** (Shareable Content Object Reference Model) to enable interoperability between third-party courseware and the LMS and between different LMSs. These standards do not guarantee the interoperability, but they are a step in the right direction. The origin of many of these standards come from engineering, the airline industry, and the US military who operate on a corporate training model, so they are less relevant to education courseware, but may help if you are switching platforms or making courses available to others using different platforms. See Appendix D, Course Authoring Tool Features, and Chapter 17, E-learning Standards.

Competency and performance management:
- Identify needed competencies for individuals and groups in order to perform the necessary work.
- Track performance for both individuals and groups and identify where improved performance is needed.
- Link to human resource systems. This is another feature not directly relevant to an education environment.

Reporting and analytics:
- Ability to generate reports on participation, assessments, etc.
- Includes standard and custom reports.
- Reports generated in graphical form.
- Financial analysis.
- Survey generation and analysis.
- Regulatory compliance tracking.

Multiple language support: Multinational corporations usually require different languages. Many LMSs provide for multiple languages now, but this does not necessarily include true **localization** which requires adaptation of the content and design to fit local cultures. True localization is far more extensive than translation and requires substantial additional work.

The following functions are usually offered as separate capabilities or as part of a suite. Often the **course authoring** and web conferencing tools are supplied by separate vendors.

- **Course development/authoring:** A means of creating online courses. Many of the tools used in business are designed for creating interactive, self-directed courses complete with tests and assessments. Examples of such tools include Authorware, ToolBook, Lectora, ReadyGo, and Outstart Trainer. Other tools offer so called rapid e-learning development—conversion of Word, PowerPoint, etc. documents into interactive courseware. Examples include Articulate, Elicitus, Impatica and KnowledgePresenter.
- **Virtual classrooms/Web conferencing:** Synchronous instructor-led classes over the Web. Tools include Microsoft Live Meeting, Elluminate, Adobe Acrobat Connect Professional (formerly Macromedia Breeze), LearnLinc, Webex, Interwise and Saba Centra.
- **Learning content management/learning object repository:** A means of storing developed courseware in learning object repositories (databases) so that it can be retrieved and reused. In addition to suites offered by the major LMS vendors, notable others include Eedo, Chalk Media Chalkboard, and Cornerstone OnDemand.

One of the main distinguishing features between corporate and education LMSs is that for most business LMSs provide fairly complete registration systems for classroom instruction as well as e-learning. Full scale registrations usually already exist in educational institutions.

LMSs sometimes offer e-commerce capabilities that allow both internal and external people to pay for courses. These features for managing both classroom instruction and e-commerce are not usually part of education LMSs. The exceptions to this rule are Blackboard, which does offer a commerce solution for educational institutions, and Moodle, which integrates with PayPal for this purpose.

In the corporate environment, there is a great deal of reliance on pre-packaged, self-directed courses. Many of these will likely be generic courseware available from such suppliers as SkillSoft, Thomson NETg (Skillsoft now owns NETg), ElementK, and others. The off-the-shelf courseware usually covers such topics as **information technology** (IT) skills, communication skills, business processes, and sales training. In most cases there is also the need for custom courseware for training on proprietary products and solutions, and unique situations. It is extremely important that the LMS can work with all possible third-party courseware and tools used to create custom courseware.

Most corporate LMSs are limited in their use of communication tools. Unlike education LMSs, there is no assumption that an instructor will be available via email. This will probably change somewhat as businesses recognize the value of communication tools, **communities of practice**, mentoring, blogs, wikis, etc.

As corporate LMSs expand their capabilities, they begin to overlap with human resources functions, with terms like performance management, human capital management and **talent management** becoming frequently used by the major vendors.

The major vendors of corporate LMSs are:

- Generation21
- GeoLearning
- GeoMetrix Training Partner
- Intelladon
- KnowledgePlanet
- Learn.com
- OutStart
- Plateau
- Saba
- SumTotal Systems

These are the ten largest vendors in the corporate LMS market. Open-source systems are not yet a major factor in the corporate environment, but as Linux becomes more popular this may change.

As with any enterprise software system purchases, there are generally two approaches—"best-of-breed" in which companies look for the best possible tools in each category, and the single vendor approach in which all the tools are obtained from a singe vendor. The former can give the organization all the functions it needs while creating some integration challenges in getting the tools to work with each other. The latter will probably simplify integration, but may sacrifice some functionality.

Tip

Business LMSs typically include classroom registration features and do not include course development tools. Education LMSs are just the opposite. Education LMSs are also strong on communication tools.

For a detailed comparison of the features of education and corporate LMSs, see Appendix A, LMS Comparison Matrix.

Tip

Corporate LMSs tend to be very expensive for an educational environment but some of the more modestly priced ones may be suitable, particularly in a continuing education application where registration and e-commerce features may be needed.

Standards

E-LEARNING STANDARDS

Technical, design, and accessibility standards for e-learning are in a constant state of flux. Technical standards continue to be developed to provide for compatibility between systems and courseware, and for the definition and use of learning objects. See Appendix B, Standards Bodies and Links, for a list of standards bodies and links. Several different international organizations are working on these standards. The **AICC** (Aviation Industry Computer-based Training Committee) standard was developed more than 10 years ago when the aviation industry (one of the early adopters) recognized the problem of interoperability among systems. **SCORM** (Shareable Content Repository Reference Model) is a collection of technical standards for different purposes. It is developed by the Advanced Distributed Learning (ADL) initiative of the US Department of Defense. SCORM was begun in 1997, and the standards continue to evolve. Many LMS vendors and courseware vendors claim to be standards-conformant, but that does not yet guarantee that the systems will be interoperable. Some course designers are against standards altogether, claiming that it constrains creativity and the facilitation of learning.

INSTRUCTIONAL DESIGN STANDARDS

At least as important as technical standards is the quality of the instructional design. Instructional design certification is offered by **ASTD** (American Society for Training and Development. "Designed for asynchronous Web-based and multimedia courses, the **E-Learning Courseware Certification** (ECC) recognizes courses that excel in usability and instructional design". (American Society for Training and Development, n.d., para. 4)

ISPI (International Society for Performance Improvement) offers numerous publications and awards addressing design standards for e-learning.

E-learning design can also be certified by eQcheck. "The eQcheck is designed to ensure that a product will give satisfactory performance to the consumer. The standards on which the eQcheck is based are the Canadian Recommended E-Learning Guidelines—the CanREGs, published and copyrighted by *FuturEd Inc.* and the Canadian Association for Community Education (2002)" (eQcheck, n.d., para. 2).

ACCESSIBILITY STANDARDS

These relate directly to general Web accessibility, particularly for the visually impaired. The initiative is led by the Web Accessibility Initiative (WAI) of the World Wide Web Consortium (http://www.w3.org/WAI/). There is also the Web Standards Project, which "is a grassroots coalition fighting for standards which ensure simple, affordable access to web technologies for all." (http://www.webstandards.org/). In the US, Section 508 of the Rehabilitation Act requires access to electronic and information technology procured by Federal agencies. See Chapter 11, Accessibility and Universal Design, where this is discussed extensively.

> **Tip**
> Claims of standards conformance do not yet guarantee interoperability. Tools and courseware should be tested with the LMS to be sure.

Course development

Course development is also referred to as course authoring. Courses made available on the Web are simply collections of web pages designed to help people learn. They may be a group of resources to which a learner is referred, or they may be carefully crafted sequences of learning events that include interactivity, tests and assessments, animations, screen simulations, video, and audio. It is possible to create web-based learning courses by using templates or by programming directly in HTML or Flash but there are course authoring tools available which are designed to simplify the process.

In education LMSs some course authoring capability is usually included. Some instructors may prefer to use additional tools. Course authoring is not usually included in corporate LMSs, but is available separately. as part of an LCMS or as part of a suite of products.

Course authoring tools like Adobe/Macromedia Authorware and SumTotal ToolBook have been around since before the World Wide Web, and have evolved with it. Not all the tools do everything. The more complex ones require considerable expertise and can benefit from programming experience. Simpler ones are easier to use but may be somewhat limited in capability. Some are tools for converting PowerPoint presentations or Word documents to web code. They are often referred to as "rapid e-learning" development tools. Others are specialized to produce software simulations, or tests, and assessments.

In education LMSs course development tools provide the means for teachers to perform the following types of activities:

- **Provide and organize resources related to the learning objectives**: Most education solutions allow instructors to create simple text pages or web pages. These can be used for a syllabus, a project outline, assignment instructions, grading guidelines, and much more. LMSs usually provide support for multi-media materials such as video and audio streaming or modules or simulations built in other software tools. If instructors are using tools such as Dreamweaver, Flash, or other authoring tools, it is important to obtain an LMS that supports the code generated by these products particularly for any rich media, interactivity, and for recording scores on tests.
- **Set up communication tools for the students to use**: LMSs often give instructors and students the ability to send email to one another via the LMS. Instructors can also set up group areas, discussion forums, wikis, and other tools to allow students to communicate about general topics with little to no facilitation by the instructor or teaching assistant. For example, you can use a discussion forum as a way for students to introduce themselves, to provide technical support to each other, or to continue an interesting discussion if you run out of time in the classroom. Many LMSs also provide a calendar to which students, instructors, and the LMS itself can add events. Students can schedule study groups, instructors can remind students of special events such as field trips, and the LMS itself will mark events such as quiz dates or assignment due dates.
- **Facilitate and manage online interactivity related to the learning objectives**: Those same communication tools, and several others, can be used to facilitate online interactivity related to coursework. Depending on the LMS, instructors can use single-question polls to gauge student attitudes or knowledge about a reading, discussion forums to have students analyze a lab procedure before entering the lab, wikis to have students collaboratively solve a problem or work on a project, or chat to let small groups discuss required field work in real time.
- **Assess student performance (skills, knowledge, and attitudes)**: LMSs provide avenues for students to submit assignments and for instructors to evaluate different types of student performance. For example, students can submit written essays in several ways, including, but not limited to, digital drop boxes, discussion forum threads, discussion forum attach-

ments, wikis, or "assignment" modules. Instructors can require students to use different submission pathways to create different types of assignments. You might use a discussion forum to allow peer review, wikis to engage students in collaborative writing exercises, or assignment modules to make it easy to collect all the essays. LMSs usually provide tools for creating and delivering quizzes as part of the courses. Instructors may also use other tools for this purpose such as Questionmark Perception, Respondus, Hot Potatoes, and test banks that publishers provide. If you plan to use these tools, it is important to be sure that your LMS can work with the code generated by these third-party software solutions.

- **Assess teaching effectiveness**: Many LMSs contain survey tools to allow instructors to collect feedback about specific topics, including teaching effectiveness (see Chapter 24, Evaluating and Improving Your Online Teaching Effectiveness, for more information on this topic). The different LMSs vary the possibilities for instructors and students. Some allow anonymous student responses and some contain specific survey instruments for teaching effectiveness. If the LMS does not do everything you want, you can always link to an external survey tool on the Web. For example, the Free Assessment Summary Tool (http://getfast.ca) allows instructors to use a database of more than 350 teaching effectiveness questions, to create twenty questions per survey, and to download the results as an Excel spreadsheet, all for free.

Tip
Be sure your LMS will work with the additional tools that instructors are likely to use for course development.

Course development in corporate LMSs

Course authoring tools are not usually included as part of a corporate LMS, but are available separately or as part of an LCMS.

For corporate training there is a strong reliance on pre-packaged, self-directed courses. These can be purchased from third-party vendors like Skillsoft, Thomson NETg (now a part of Skillsoft, making Skillsoft the single largest vendor of such courseware by a substantial margin), ElementK (now owned by NIIT), and Harvard Business School Publishing. Generic courseware is available for learning skills in communication, business, leadership, management, finance, information technology (IT), sales, health and safety, and more specialized topics.

Most companies also have a need to develop courses on for unique situations and proprietary products and services. There are many tools available for this purpose. Most of these are designed primarily for creating self-directed online courses, but they can also be used to develop classroom materials.

Some examples of popular course authoring tools:

- SumTotal ToolBook
- Adobe Authorware, Flash, Dreamweaver, and Acrobat Connect Presenter
- Trivantis Lectora
- ReadyGo Web Course Builder
- MaxIT DazzlerMax
- Outstart Trainer

Course development can be very time consuming. There is a lot of material already available in *Microsoft* Word or PowerPoint. So-called rapid development, or rapid e-learning tools are designed to quickly convert these documents to e-learning courses. Examples include:

- Articulate
- Impatica
- Adobe Presenter (formerly Macromedia Breeze Presenter)
- KnowledgePresenter

Most of these tools (with the exception of Impatica) convert PowerPoint and Word documents to Flash because it is web-friendly and so widespread. (According to Adobe, Flash is already installed in 97 percent of browsers.)

Software simulation tools

There are numerous tools designed specifically for the simulation of computer screens by recording screen interactions. For example:

- Adobe Captivate (formerly Macromedia RoboDemo)
- TechSmith Camtasia
- Qarbon ViewletBuilder

Many of these also do PowerPoint to Flash conversion.

Test and assessment tools

Most course authoring tools can create and deliver tests and quizzes as part of the courses. Instructors may also want use test banks that publishers provide, and/or other, more powerful tools built specifically for testing. For example:

- Questionmark Perception
- Respondus
- Hot Potatoes

There are well over 100 available sources for software that can be categorized as course authoring tools.

When choosing an LMS, be sure that it can support any third-party generic courseware or content authoring tools being used. Particular attention should be paid to the LMS's ability to launch the courses, and track and record interactions and responses to quizzes. Support for standards helps, but it is no guarantee. You should test the LMS with the tools and courseware that you will be using. You should also determine how accessible the file formats are for students with disabilities. (See Chapter 11, Accessibility and Universal Design, for more information about accessibility.)

Tip
Be careful with rapid development tools. Speed of delivery can be very important but make sure you are not just making bad Word or PowerPoint documentation into even worse e-learning courses.

Virtual classrooms/web conferencing

Web conferencing tools can bring a new dimension to your programs. They add presentations, audio, video, graphics, synchronous chat and voice interactions to meetings and classes at a distance. They can effectively complement online courses where some live interaction is called for and where there is an immediate need for new information or skills. Recordings can often be made to enhance asynchronous distance education programs. In an education/training mode, they are often referred to as virtual classrooms.

With a few exceptions, virtual classrooms are not included as part of an LMS, either for education or business, but are available separately. Some LMS vendors partner with web conferencing software vendors to integrate the products so they will work well together.

There are more than 50 vendors of these products. In most cases, these systems can support either corporate or education needs. Some of the best known include:

- Centra Live (now owned by Saba)
- Citrix GoToMeeting
- Elluminate
- Horizon Wimba
- iLinc LearnLinc
- Interwise Connect
- Adobe Acrobat Connect Professional (formerly Macromedia Breeze Live)
- Microsoft NetMeeting (free but apparently no longer supported)
- Microsoft Live Meeting (formerly Placeware)
- Tapped-In (a free text-only based conferencing system)
- WebEx Training Center

Licensing of these products varies from annual subscriptions (Elluminate) to pay-as-you-go (WebEx) to free (TappedIn). If they are only used occasionally, then the pay-as-you-go option is probably the best choice. However, that can rapidly get very expensive.

For an extensive list of features of these products, see Appendix E.

Tip
As with any software or instructional approach, it takes considerable skill to facilitate an online session effectively.

Learning content management

The management of learning content involves saving developed courseware as learning objects in a learning object repository (database). It is catalogued using **metadata** (descriptive tags) so that it can be easily found and retrieved by anyone who has access to it. It supports institutional or corporate reuse of the learning objects. Systems that do this are often called learning content management systems (LCMS). They are specialized content management systems.

Most education LMSs include at least some capability for content management. Some even call themselves learning content management systems.

Learning content management is not usually a feature of the corporate LMS, but some of the major corporate LMSs include content management as part of a suite of programs. It is also available separately. Most separate LCMSs include content authoring and some learning management features as well.

Performance support: Some corporate LCMSs provide for a feature called performance support. Also called JIT (just in time) learning, performance support allows employees to immediately access information (courses, units, and learning objects) that enables them to do their job better "in the moment". For example, if an employee working on a task cannot remember exactly how to do something, he or she can quickly access a course, or parts of a course, that will show how to perform the operation. This requires managing the course content as learning objects, and making them easily accessible to all learners. Such systems when available separately are often called **EPSS** (electronic performance support systems) but are now sometimes included as part of an LCMS. This is another concept which does not really apply in the education environment. See Appendix C, LCMS Features.

LMSs that include this capability as part of a suite include:

- Cornerstone OnDemand
- Generation21
- GeoLearning
- KMx
- LearnCenter
- Plateau
- Saba
- Sum Total Systems

Some examples of separate systems are:

- Chalk Media Chalkboard
- dominKnow LCMS (formerly Galbraith Media)
- Eedo
- Outstart

Tip

Be careful about learning content management. Everyone thinks, "What a great idea—save the course materials in a way that they can be reused easily." But too often it doesn't happen. Some organizational cultures do not support the value of sharing. This is a great tool if it is used but an expensive mistake if not used.

Needs assessment

Choosing an LMS is not a technology decision. It is primarily a leadership and change management decision. No matter what system you adopt, it will change the way you do things. Even if you adopt a system that supports your basic learning model, procedures will change. This is a major decision that calls for a careful assessment of your needs.

Before you even talk to LMS vendors or open-source LMS community members, form an expert committee of people consisting of educational leaders and administrators and instructors—people who understand how online learning works. Be sure to include some IT personnel to enlist their ideas and support and their understanding of the technology.

Consult with end users, both instructors and students, by questionnaires, surveys, interviews, and/or focus groups to determine their needs, desires, willingness, and abilities. They can identify the desirable features of the system, and give some indication of the change management factors that need to be addressed. Be careful of scope creep. When asking people what they would like to see, they will tend to ask for everything. Distinguish between the things that are truly needed and the "nice-to-haves".

Consult with people in other organizations like yours that have already gone through the process. Find out what they are using and how they like it. Read the literature and attend conferences.

Are you looking at an LMS to initiate e-learning? You may not actually need to do this. Online courses are just a collection of web pages that do not require an LMS to run them. The primary purpose of an LMS is to provide a working platform and administration for tracking the results. If you don't need to track the results, or if instructors will do it manually, then you don't need an LMS.

LMSs tend to constrain people to do things in certain ways. Some instructors and designers are frustrated by the constraints (both technical and learning) of using these systems and would prefer more dynamic learning support systems such as student weblogs and learning wikis, and even just email or newsgroups. You may prefer to give them more creative freedom. Wikis and blogs don't require an LMS but they are hard to track. Instructors can track activity manually and assign grades but it limits the analysis you can do, for example to find out to what degree students participate, how students perform on individual questions, etc. Wikis and blogs can be altered easily, so are not ideal for formal assignments (other than perhaps a team assignment to build a wiki). Individual and team essay assignments are probably best submitted to instructors via direct email messages and attachments. This would still not require an LMS to track as the instructors would be marking and tracking such assignments manually.

Tip
Obtaining an LMS will change the way you work. Choosing one is not a technology decision. It is about leadership and change.

STEPS IN THE NEEDS ASSESSMENT PROCESS

Conduct primary research

Survey, interview and conduct focus groups among your expert committee, instructors, and students to determine the primary needs of your system. Don't ask general questions like, "What do you need?" or you will get a wish list that may not be practical. See Appendix F, Needs Assessment Questions, for suggestions about questions to ask.

Conduct secondary research

(1) What LMSs are other organizations using?
  (a) Is the organization similar to your own, or have similar needs?
  (b) What made them choose that particular solution?
  (c) How satisfied are they with it?
  (d) What features do they like and not like?
  (e) What feedback have they had from students and instructors?
(2) What does the literature say?

If you are looking for an education LMS, a good source of information is the website of the Western Cooperative for Educational Telecommunications: Online Educational Delivery Applications: A Web Tool for Comparative Analysis (http://www.edutools.info/). This website contains reviews and comparative data on a large number of education learning management systems.

You may also wish to attend conferences where LMS are featured and profiled.

Good corporate conferences are:

- Learning 2007 (formerly TechLearn) (http://www.learning2007.com/)
- Training (http://www.trainingconference.com/)
- American Society for Training and Development (ASTD) (http://astd2007.astd.org/)
- International Society for Performance Improvement (ISPI) (http://www.ispi.org/ac2008/)

Good educational conferences include:

- Association for Educational Communications and Technology (AECT) (http://www.aect.org/events/)
- ED-MEDIA (Association for the Advancement of Computing in Education—AACE) (http://www.aace.org/conf/)
- Association for Media and Technology in Canada (AMTEC)/Canadian Association for Distance Education (CADE) (http://www.cade-aced.ca/conferences/2007/)
- Canadian Association for University Continuing Education (CAUCE) (http://www.cauce2007.ca)

You can expedite the process by attending virtual trade shows and online demonstrations. Check out the possibilities at http://www.virtualtechfair.com/ and vendors' websites.

Tip
For reviews of education LMS software, check out http://www.edutools.com.

If you are looking for a corporate LMS, you can check out the reports by Brandon Hall at http://www.brandon-hall.com, Bersin & Associates at http://www.bersin.com/ or by using the comparison tool at http://learning-management.technologyevaluation.com/.

Other good sources of information include the eLearning Guild (http://www.elearningguild.com/) and Chief Learning Officer magazine (http://www.clomedia.com/).

Once you have determined your requirements and have documented them carefully, prioritize them to determine the critical needs.

Tip
Be careful of scope creep. When asking people what they would like to see, they will tend to ask for everything. Distinguish between the things that are truly needed and the "nice-to-haves".

System selection

Now you can begin to research vendors and/or open-source solutions. Looking at different products can open up new possibilities, but, again, be careful of scope creep, and of being sold something just because it is the latest hot item.

Use your documented requirements and priorities to identify a manageable list of solutions (perhaps 10) from the more than 100 vendors. An evolving, fairly complete list of such vendors can be found at http://www.trimeritus.com/vendors.pdf.

Request for proposal (RFP)

Requests for proposals (RFP) follow fairly standard industry forms. At http://www.geolearning.com/rfp there is a template specifically for LMS selection but be careful about templates that are just lists of features. Include only those features that you really require. Use your documented requirements and develop use case scenarios and scripts to paint a clear picture of your LMS vision so that a vendor can provide a proposal focused on your specific environment/culture. Include reporting functions in your scenarios. Poor reporting capability is a great source of customer dissatisfaction. Be sure to ask questions about post implementation customer service because it is also a key factor in customer satisfaction. Ask vendors for references especially those for organizations similar to your own.

Ask the vendors from your list to submit proposals. When you contact vendors, the more clearly you have identified your requirements, the more attention you will get from suppliers—they will see you as a qualified prospect. A full formal RFP process may not be practical in all situations unless it is required by your organization.

See appendix G for RFP questions for vendors.

Review the proposals

Develop a rubric for scoring the proposals you receive from vendors. Make a short list of the top three to ten vendors to be invited to provide demonstrations.

Schedule meetings and demonstrations

Ask your short list of vendors or open-source community representatives (who may be members of your own organization) to demonstrate their products either at your location or online. Ask them to demo directly to the use case scenarios and demonstration scripts you developed in the RFP. Invite students, instructors, and IT people to the demos, as well as members of your core committee.

Most vendors will have pre-packaged online demonstrations of their products, but remember that these are mostly designed to show off the good features of the product that may not be relevant in your situation.

Use your rubric to have each participant evaluate the solutions. At the meetings, discuss specific details about how the vendor provides service, maintenance, etc. Try to arrange for a free, in-house trial. If possible, run a small pilot program with a small sample before rolling a solution out to the entire organization.

Note that the needs assessment and selection strategies are also part of your change management strategy. The more input people have in the decision, the more likely they will adopt it.

Make the selection

Meet with your review team to consolidate the rubrics and make a selection. The bottom line is selecting the LMS that meets your needs.

> "The average company doesn't get excited about buying an LMS; it gets excited about managing learning. It doesn't get excited about buying a new e-learning course; it gets excited about changing an employee's performance." (Elliott Masie as quoted by Ellis, 2004)

Implementation issues

Some of the factors you need to take into consideration when implementing an LMS are:

(1) **Change management**: Implementing an LMS is a major change. In a corporate environment almost everyone will be exposed to it as it becomes part of the intranet portal. The change management issues—the marketing, communication, and training initiatives that will need to be put into place to gain acceptance and appropriate use—are of paramount importance. In an educational institution, the impact will be less widespread, but change management is still important for all the instructors and students who will be accessing the system.

(2) **Timelines**: How long will it take to conduct a needs assessment, to run a pilot test, to build a user community within the organization, to build the appropriate infrastructure to support it, etc.?

(3) **Cost:** Consider the total cost of ownership (TCO); not just the cost of the software but the complete implementation and maintenance costs.

(4) **Customization**: Will you want to brand the system or change it to make it conform to the way you do things? Doing this can be more expensive than the initial licensing and can delay the implementation process significantly.

(5) **Internal or external hosting of the application:**

   (a) In-house hosting requires hardware (e.g., servers for application, database, data storage, backup systems), infrastructure (e.g., high-bandwidth connectivity, uninterrupted power supply in case of power outage), and staffing (e.g., technical support staff, training, and user support staff) to maintain the LMS. In some cases, in-house hosting can provide your organization with greater flexibility, security and responsiveness than a third-party hosting facility.

(b) With the supplier or a third party hosting it for you, it is more expensive, but you do not have to provide all of the IT support. In most cases, however, you will still need to designate or hire an in-house support person to support instructors and learners, and to be the point of contact with the hosting group. Implementation of externally hosted LMSs can be quicker. It may, however, take longer to make changes in the system after it is up and running.

(c) With open-source systems, it may be possible for you to contract with a company to host and maintain the LMS for you but the usual scenario for these will be in-house hosting.

(6) **Integration with other systems**, e.g., registration, student information systems, library or data management systems, and/or human resources systems

(7) What kind of **support** will the supplier or community (for open-source solutions) provide during implementation? For example, training, customization, trouble shooting, help desk, etc.

(8) **Training** for instructors and students

(9) **Software updates**

(10) **Conversion of existing or third-party courseware** to run properly on your new LMS.

(11) Are there other **initiatives** happening in your organization which your LMS initiative can support so that mutual success can be achieved?

Case studies

TELUS CASE STUDY: AN E-LEARNING SUCCESS STORY: IT'S ABOUT ACCESS

Telus Communications is western Canada's major telecommunications provider and the second largest in the country. It has approximately 25,000 employees across the country. Between 1995 and 1998, BC Tel (prior to the merger with Telus) developed an extensive intranet which became a great information tool for employees. Several internal websites were developed to augment the training courses offered by Learning Services. In 1998, BC Tel contracted with *SkillSoft* for about 20 of its generic, self-directed sales and communications courses to complement its manager training curriculum. The initial licence was for 2,000 participants. The interest was much greater than expected. Many employees at all levels of the organization and in all divisions discovered the courses and used the opportunity because they were "free". Within six months, the licence had to be increased to 3,500. Then additional courses were licensed for other subject areas including information technology (IT) from Smartforce and NETg.

One reason for the success of these courses is that upper management had implemented a policy that all employees would maintain a personal development portfolio, and demonstrate steps towards their goals. Because the e-learning courses were free and available to everyone, they became very popular. It is always good to have an e-learning initiative tied to other organizational objectives and initiatives. People are often hungry to get training to improve their skills and advance their careers, but they don't always get the opportunity. E-learning made it accessible.

Telus management was interested in developing some of their own proprietary courses, so an extensive review of available course authoring tools was made. Click2Learn ToolBook software was selected for this purpose. The plan was to enable more than 100 people throughout the organization to create courses using this tool, so ease of use was an important criterion. A training program was put into place to train those people. The tool was found to be useful particularly for training on new products and services. Telus typically introduces several new products and services each month, and traditional training approaches were simply too slow to address this. One of the first courses developed was on a new feature for telephones called "Talking Call Waiting". The course was made available to sales and customer service people. In this case e-learning made it possible to distribute training to everyone who needed it much more quickly than could have been done by traditional methods.

Another course on **ADSL** (asymmetric digital subscriber line high-speed Internet connection) was made available to everyone and had more than 1,000 hits in the first few days.

Up to this point, only very simple management tools had been used to track the results, and a good deal of work was done manually. Telus then did a study of LMSs and decided that they would build their own system because they had an extensive and skilled IT staff that had developed parts of such a system for individual departments.

In 2004, Telus reported that it had developed 300 custom courses for its employees and there were a total of 100,000 course completions for both custom and generic courses. E-learning is now a way of life for Telus.

SAN FRANCISCO STATE UNIVERSITY CASE STUDY: AN OPEN SOURCE SOLUTION

by Kevin Kelly, Online Teaching and Learning Coordinator

In *Images of Organization*, Gareth Morgan (2006) describes double-loop learning, or a process by which organizations go beyond simple behavioural changes to reach goals. They do this by questioning the way they normally do things in an effort to improve. The decision process to move from one learning management system to another might be considered an example of double-loop learning.

San Francisco State University (SFSU) began this process after experiencing some technical difficulties with a commercial LMS. The campus had experienced a number of issues related to an upgrade, including intermittent performance issues and a thirteen-hour outage during finals week. While the vendor worked hard to alleviate the problems, the campus began to discuss the future. Based on feedback from faculty focus groups, the campus decided to investigate alternative LMS solutions.

To begin, academic technology staff members looked at several commercial and open source solutions. During the focus groups, the faculty members provided a simple requirement: "We can't go backward." In other words, any alternative had to have the same capabilities as the existing LMS. After setting up mock courses in more than ten environments, the academic technology team found that Moodle provided the flexibility to meet faculty and student needs quickly, as well as a nearly parallel set of features for online teaching and learning.

After selecting Moodle, the team created the LMS investigation roadmap. At each stoplight on the roadmap, the campus would evaluate the project status. If Moodle was not meeting teaching and learning needs, then the campus would start over with another tool. If faculty and students gave a "green light", then the investigation would continue.

In Fall 2004, SFSU began an alpha test with five instructors and 300 students. One instructor with more than 100 students in the alpha test liked it so much for her large class that she moved several large sections totaling 850 students to Moodle for the beta test. In Spring 2005, the campus ran a beta test with 25 instructors and 1,500 students. The academic technology team performed extensive outreach to get faculty in all nine colleges to participate in order to evaluate the needs of different disciplines. An Associate Vice President requested scalability tests in Fall 2005 and Spring 2006 with over 100 instructors and 6,000+ students and 9,000+ students respectively. At each stage, the campus used the roadmap test to verify that it was on the right track.

At the same time, the Academic Technology team worked with the Disability Programs and Resource Center to conduct accessibility testing. This involved more than running a web-based verification program. To make sure that the accessibility testing would address real needs, the campus asked students with disabilities to help test the LMS with assistive technology such as JAWS, a screen reader application, and Dragon Naturally Speaking, a voice recognition program. Similarly, the Academic Technology team worked with an SF State faculty member and a UC Berkeley graduate student in a usability related course to facilitate usability testing with Moodle.

The faculty-run Educational Technology Advisory Committee worked with the team throughout the process and, at the end, made a recommendation to move exclusively to Moodle as the online teaching and learning environment. The recommendations included a list of items for the campus academic technology unit to address, such as improving the grade book and creating a list of frequently asked questions for support. Based on this recommendation, the Provost announced that the campus would use Moodle exclusively when the vendor contract expires in Summer 2007.

While the original drivers were technological, the campus also received equivalent pedagogical and administrative benefits. Instructors have been changing the way they teach, and writing articles about the scholarship of teaching and learning. As Moodle is open source software, the campus has created a consortium of regional two-year and four-year colleges and universities to create economies of scale related to software development, training and support, and other forms of collaboration. More is yet to come.

Summary

When considering the purchase of any learning management system it is essential to assess your needs carefully before buying and to implement them properly to ensure success.

Here are a few key points:

- There are at least 100 LMSs available for business, and at least 50 available for education. Many of the latter are open-source. Although they offer different features, it is best not to ignore the LMSs from the other sector.

- There is no single "best" solution. The ideal solution is the one that fits your needs and environment.
- Obtaining an LMS will change the way you work. Choosing one is not a technology decision. It is about leadership and change.
- Be sure your LMS will work with the tools that instructors are likely to use for course development, and that it will integrate with other systems such as HR and registration systems.
- Be careful about learning content management. Everyone thinks, "What a great idea—save the course materials in a way that they can be reused easily." But too often it doesn't happen. Some organizational cultures do not support the value of sharing. This is a great tool if it is used, but an expensive mistake if not used.
- When assessing your needs be careful of scope creep. When asking people what they would like to see, they will tend to ask for everything. Distinguish between the things that are truly needed and the "nice-to-haves".

THE FUTURE

> "We contend that the current technical design philosophy of today's learning management systems is substantially retarding progress toward the kind of flexible virtual classrooms that teachers need to provide quality education". (Feldstein & Masson, 2006, para. 4)

There is a need for third generation learning management systems, based on the **constructivism** theory of learning and social networking in order to support online collaborative learning communities. (See Chapter 30, Supporting E-learning through Communities of Practice.) Developing these third generation systems will be a challenge, especially for the corporate models that haven't figured out yet how to manage simple emails. As of this writing, education LMSs are ahead of corporate LMSs in this respect, but the latter will also need to include more social learning tools (wikis, blogs, etc.). In the immediate future, LMSs will continue to be primarily administrative tools and only secondarily learning tools. Instructors and students will be challenged to find ways to use them so that they make learning easy.

The most used electronic learning tools are Google and other search engines. In the near future almost everything will be available online. Ten years ago a colleague of mine said that everything that is current and worthwhile is already online. This is much truer now. Google and the Gutenberg Project are putting libraries of books online. Google is putting maps on the Web. Universities like Massachusetts Institute of Technology (MIT) are making their course materials available online. Communities are creating knowledge repositories with wikis. Blogs are making almost everyone's opinions available, whether we want them or not.

Distributed learning platforms will enable people to access learning modules and services from anywhere. Mobile learning solutions will enable people to access information on their personal digital assistants (PDAs), and cell phones.

The challenge will be for learners (all of us) to manage all of this. Much of it will happen beyond the scope of any locally installed learning management system. Google and other search engines will evolve to provide management features.

Content will be organized as reusable learning objects much like learning content management systems do, but on a much broader scale. Wikis and folksonomies (also called "tagging") may help solve this. Wikipedia defines a folksonomy as "an Internet-based information retrieval methodology consisting of collaboratively generated, open-ended labels [or tags] that categorize content such as Web pages, online photographs, and Web links".

Personalization and context-aware devices such as **GPS** (global positioning system) units will also help. Personalization is the ability of a website to adapt to its users, as Amazon does when it suggests other books you may like, or for the user to adapt the website for his or her own purposes, as Google does when it allows you to customize its home page. GPS units can locate the user so that information can be customized for that location. For example, a user who lives in Chicago but is visiting New York would receive weather information for New York.

LMSs will continue to exist for company and institutional record keeping, but much of the learning will happen beyond their scope.

Glossary

AICC. Aviation Industry CBT Committee, one of the technical standards to enable interoperability between LMSs and third-party courseware. The aviation industry was the first to recognize the need and developed the first standards. (http://www.aicc.org/)

ASTD. American Society for Training and Development (http://www.astd.org/)

Asynchronous. Literally, not at the same time. In e-learning, usually email or discussion groups, or other communications between participants that do not occur in real time. Self-directed courses which learners do on their own without the presence of an instructor are also asynchronous. Asynchronous communication offers communication at the convenience of the learner, the opportunity to consider responses carefully, review them before replying, and the ability to track and revisit discussions.

Blended learning. A mix of classroom, self-directed, synchronous and asynchronous approaches. Blended courses may also be called "hybrid" courses.

Blog. An abbreviation of weblog, a publicly accessible personal journal that is regularly updated, similar to a personal diary, but shared over the Web.

Community of practice. A group of people who share a common interest, need or objective. Online communication tools can facilitate the exchange of information in such a group.

Constructivism. A theory of learning that "acknowledges that individuals are active agents, they engage in their own knowledge construction by integrating new information into their schema, and by associating and representing it into a meaningful way". (Hsiao, n.d., para. 6 (II 2))

Content management systems (CMSs). Computer programs for managing all forms of electronic content in a way that the content can be easily retrieved and reused.

Course authoring/development. Software that facilitates the development of electronically delivered courseware. May include the ability to include audio, video, Flash animations, tests and quizzes, etc.

Course management system (CMS). A term often used for an education-oriented LMS. It differs from a business-oriented LMS primarily by including course authoring capability but not including general registration for classroom courses. An alternative term is virtual learning environment (VLE).

E-commerce. Tools to facilitate online shopping, with an automatic transfer of funds. In the context of this chapter, funds are transfered from learner to institution or between departments. The tools may include a catalogue, a shopping cart feature and allow secure credit card transactions as well as other forms of payment. Essentially synonymous with e-business.

E-learning. Any learning opportunity delivered electronically, usually through the Internet. Synonymous with online learning and web-based training.

EPSS (electronic performance support systems). Tools built into an LMS to enable employees to access information as they need it. Also called just-in-time learning.

GPS (global positioning system). A satellite based system that determines the receiver's location, speed, and direction.

Information technology (IT). The people, computers and computer software systems that support an organization. Often referred to as ICT (information communications and technology) in an educational context.

ISPI. International Society for Performance Improvement (http://www.ispi.org/).

Learning object. Any digital entity (text, graphics, animations, pages, modules, etc.) that can be used, re-used or referenced during technology-supported learning.

Learning management system (LMS). Computer software designed to manage the organization, delivery, and tracking of online courses and people's performance. They are sometimes called virtual learning environments (VLE) or course management systems (CMS). Corporate learning management systems are also designed to manage classroom instruction.

Learning content management systems (LCMS). Content management systems specifically designed for managing learning materials. Typically include a searchable learning object repository or database.

Localization. In software, this includes translation to other languages, but also requires adaptation of the content and design to reflect local cultures. It is much more extensive than just translation and requires substantial additional work.

Metadata. Data that describes other data. Metadata are digital words that uniquely describe other data such as a learning object. Metadata are invisible to the viewer but visible to the system. The most familiar metadata are HTML tags on websites.

Open-source systems/software. Computer software whose source code is available free under a copyright licence that permits users to study, change, and improve the software, and to redistribute it in modified or unmodified form.

Performance management. The process of managing the workforce of a company to optimize corporate performance by employing strategies for skills, competencies, training and development.

Personalization. The ability of a website to adapt to its users and/or for the user to adapt the website for his or her own purposes.

SCORM. Shareable Content Object Reference Model. A collection of technical standards including AICC, IMS, etc. to enable interoperability between LMSs and third-party courseware.

Self-directed. Any learning done without the direct assistance of an instructor or interaction with other learners.

Synchronous. Classroom, virtual classroom or online chat. Synchronicity offers the benefits of immediate instructor presence and support, and the social structure that many people require for effective learning.

Talent management. The process of managing the workforce in a company to optimize recruiting, retention, performance in conjunction with training and development.

Virtual classrooms/Web conferencing. Computer software that provides for synchronous meetings and training classes over the Internet, and includes audio, whiteboards for presentation and graphics, participant chat, and data sharing.

Virtual learning environment (VLE). Synonymous with LMS or course management system (CMS).

VOIP. Voice over Internet protocol. Enables direct audio connections over the Internet.

Weblog. See blog..

Wiki. An online collaboration model and tool that allows users to add and edit content of a website.

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Appendix A: LMS comparison matrix

This LMS comparison matrix offers a quick, generalized look at how the solutions for educational and corporate uses compare to one another. The general descriptors below do not reflect the situation for every solution in either category. Open-source communities and LMS vendors are constantly updating products, so be sure to look at each product individually when you have narrowed down your list of choices.

Feature	Corporate LMS	Education LMS
Classroom course management	Included	Not included
E-learning management	Included	Included
Blended learning mgmt.	Included	Not included
Course development	Not included; available as an extra	Included
Course content management	Not included; available as an extra	Included but functionality may be limited.
Web conferencing/ virtual classroom	Not included; available as an extra	Not included; available as an extra
Grade book	Assessment reporting available in a report format	Included
Quizzes	May be included. Sometimes available as an extra	Usually included
Communication tools—email, discussion groups, etc.	Included but at a lower level of priority than for education LMS	Included
Financial analytics	Included	Not included
Reporting	Some reporting features are included but may be limited.	Some reporting features are included but may be limited.
Performance support	An LCMS feature available as an extra.	Not included
Competency and performance tracking (see above)	Often included	Not included
Support for e-learning standards	Included	May or may not be included
Multiple language support	Often included	May be included
Interoperability with third-party courseware	Included but should be tested	Not included but may be possible through standards conformance
Personal web page publishing for instructors and students	Not included	Included
Self-evaluation	Not included	Included
Administration tools	Extensive	Ability to create accounts and monitor activity.
e-Commerce	Often included	Available as an extra.
e-Portfolio	Not included	Available as an extra
File and workflow management	May be included	May be included
Streaming audio and video	May be included	May be included
Access to electronic libraries	May be included	May be included

For a comparison of specific education LMSs, visit the edutools website (http://www.edutools.info) generated by the Western Cooperative for Educational Telecommunications (WCET). The site contains an engine that allows you to run a comparison of different versions of about 40 different LMSs, including many listed in this chapter.

Appendix B: Standards bodies and links

- **Accessibility standards**:
  Web Accessibility Initiative (WAI) of the World Wide Web Consortium—
  http://www.w3.org/WAI/.
  The Web Standards Project
  http://www.webstandards.org/.
  Section 508 of the Rehabilitation Act
  http://www.section508.gov/
- **Aviation Industry Computer-based Training Committee (AICC)** http://www.aicc.org/index.html.
- **Canadian Core Learning Resource Metadata Application Resource (CanCore)**
  http://www.cancore.ca/elementset.html
- **Centre for Educational Technology Interoperability Standards** http://www.cetis.ac.uk/
- **Dublin Core Metadata Initiative**
  http://dublincore.org/

- **Eduspecs** http://eduspecs.ic.gc.ca/pub/overviewofspecifications/index.html
- **IMS** http://www.imsproject.org/
- **Instructional Design Standards**:
  E-Learning Courseware Certification (ECC) http://www.astd.org/astd/Marketplace/ecc/ecc_home.htm
  ISPI (International Society for Performance Improvement) http://www.ispi.org
  eQcheck http://www.eqcheck.com
- **International Organization for Standardization (ISO)/International Electrotechnical Commission (IEC) Joint Technical Committee (JTC)1 Subcommittee (SC)36** http://jtc1sc36.org/
- **International Standardization Organization (ISO)/IEC JTC1 SC36** http://jtc1sc36.org/
- **Learning Technology Standards Committee (LTSC)** http://ltsc.ieee.org/
- **Merlot** http://www.merlot.org/
- **National Institute of Standards and Technology** http://www.nist.gov/
- **Open Geospatial Consortium** http://www.opengeospatial.org
- **Schools Interoperability Framework (SIF)** http://www.siia.net/sif
- **Shareable Courseware Object Reference Model (SCORM)** http://www.adlnet.org/
- **The eLearning Guild** http://www.elearningguild.com/
- **www.StandardsLearn.org** http://www.standardslearn.org/home/

Appendix C: Learning content management system (LCMS) features

Learning content management system (LCMS) features

- Different levels of access for users
- Catalog of learning objects and templates
- Import capability for third-party and custom authoring tool course content
- Actions such as import, export, move, delete, relate, contain, status update, and metadata element value updates can be performed on selected single or multiple content objects
- Tracking of knowledge assets
- Workflow design, use, and management
- User definition of levels of learning objects
- HTML presentation
- XML storage and retrieval
- Content, data and user classification
- Content based filtering
- Portal integration (will work with organizational web portals)
- Capture of electronic documents and metadata
- Thesaurus/classification scheme
- Options for records and documents disposal
- Document authoring
- Document searching and retrieval
- Aggregates groups of records
- Cross-references documents
- Saves and converts documents of different types
- Image scanning
- Audits and produces reports on document workflow
- Provides for system backup, rollback and recovery
- Provides tools for easy author/user access
- Provides security and authentication of users
- Provides user profiles
- Provides password and privilege management
- Provides role management
- Provides management of digital assets (photographs, animations, video, music, etc.)
- Provides mass storage capability
- Provides reports and statistical management
- Meets reliability and performance standards

Version control

- Check-in/Check-out
- Version labelling
- Rollback and restore
- Reporting

Metadata

- Creation and editing of metadata (descriptive tags)
- Non-technical users can configure and manage metadata
- Metadata taxonomy creation and management
- Imports metadata conforming to standards
- Assigns or automatically captures metadata element values as a single content object is captured or imported
- Authors notified of duplicate metadata element values or content during creation

Third-party integration (list of enterprise systems and courseware)

Standards support

Appendix D: Course authoring tool features

Course authoring tool features

- Fully browser-based web authoring (editing directly in a browser)
- Templates
- Ability to create and manage templates
- Wizards
- WYSIWYG (what you see is what you get) editor
- In-line cascading style sheet rendering (maintains style sheet layout)
- Preview mode
- Import content from Word
- Import content from PowerPoint
- Access to learning objects from a repository
- Content editor provides standard word processing editing features
- The content editor produces valid HTML/XHTML code
- Automatic course menu/map creation
- Choice of navigation buttons and scenarios
- Glossary/dictionary creation
- Bookmarking (provision for students to return to specific points in a course)
- Insert hyperlinks
- FAQ creation
- Manages and updates links
- Multiple languages
- Workflow to manage content development (tracks versions and has check out, check in for different users)
- Can launch third-party applications
- Version control
- Other

Rich media

- Rich text (maintains text formatting)
- Graphics formats
- Animation
- Flash
- Audio
- Video
- Editing tools for graphics, audio, video, animation

Interactivity

- Pre-tests to build course curriculum
- Tests
- Branching based on learner responses
- Computer screen simulations
- Role-play simulations
- Hot spots (areas of a web page or a graphic which provides feedback or more information with a mouse rollover or click)

Appendix E: Virtual classroom/ web conferencing features

Registration

- Scheduling of sessions
- Registering participants
- Email reminders with links to log-in page

Interactive features

- Instant text messaging among learners and with instructor
- Threaded discussions
- Breakout rooms
- Video
- Notepad for learners
- Time remaining clock
- Participants can leave temporarily
- Indicators for status of other participants

Whiteboard

- Anyone can use whiteboard
- Text and drawing tools
- Clip art
- Application sharing
- Remote control of applications can be granted
- Participants can save whiteboards
- Synchronized web surfing

Sound

- **VOIP** (voice over Internet protocol)
- Telephone conferencing
- Leader can allow anyone to speak
- More than one voice at a time

Moderator control

- Able to give participants control
- Moderator can see what participants are getting
- Multiple moderators supported

Feedback tools

- During presentation
- Following presentation
- Applause tool
- Speed up or slow down indicators
- Emoticons

Polling and testing
- Audience polling or testing during presentation
- Yes/no, multiple choice, etc.
- Reporting results of polling/testing during presentation
- Graphing of polling results

Recording
- Screen and sound recording
- Initiated by participants or instructor/administrator only
- Editing of recording

Technical features
- Compensation for low speed connections
- Interoperability with third-party LMS /LCMSs
- Support for different platforms—Window, Mac, Unix, etc.

Appendix F: Needs assessment questions

QUESTIONS FOR YOUR EXPERT COMMITTEE

Overall considerations
- What are the primary business drivers that bring you to consider an LMS?
- What is your philosophy of learning, and how do you want the LMS to support it?
- Who will make this decision: the committee or a high level individual?
- What are the organization's cultural and internal political factors in this decision?
- Are you primarily interested in facilitating student learning or in tracking the results?
- Do you want to emphasize self-directed, or instructor-facilitated learning?
- Do you want e-learning to enhance or replace existing courses?
- Is return on investment (ROI) important to you? If so, what are your metrics for determining ROI (including both tangible and intangible elements)?
- Are the systems you are considering widely used and supported?
- Do you want the LMS to be used universally throughout your organization or is this for a particular function or department?
- What is your budget? What is the total cost of ownership including implementation, maintenance and upgrading costs?
- To what scale will your organization ultimately use the LMS? (1,000 users? 10,000 users? 50,000 users? More? How many instructors? How many administrators?). Think five or ten years ahead.
- If you wish to consider open-source solutions, do you have a strong and supportive IT department to implement, manage, and support it, or will you seek a hosted solution to provide that support?
- To what extent will the LMS be accessible to instructors and students with disabilities?

Audience
- Will online learning be an alternative or a requirement for some people?
- If you are an educational institution, will it be just for continuing education or for all students and/or staff?
- Will it be available to students beyond your jurisdiction? Will it be available for customers, suppliers or the public as well as your employees?
- Will prerequisite learning be required?

Features
- Does it have the features you need?
- Are you interested in blending e-learning with classroom learning?
- Do you want e-learning to be both synchronous and asynchronous?
- Will you need to manage the physical distribution of materials to students as well as providing them with tools online? Will students need to buy hard-copy textbooks or will they be provided online?
- To what extent do you want to include assessments, including feedback and surveys as well as online tests?

Look and feel
- Is it easy to use for instructors and students?
- How do you want your courses to look? Do you want them to have similar navigation so it becomes intuitive for students?

Extras
- Will you be purchasing content from outside sources?
- Will you need additional course development tools?
- Will you need web conferencing/virtual classroom capability?
- Will you want to manage your course content and learning objects so that they are reusable by others?
- Will you need to allow students to register for classroom or distance education courses?

E-commerce

- Will you want to share or sell what you are doing to other organizations?
- Will you need some kind of online payment system to allow some students to pay for courses?

Change management

- Will you want to customize the product to give it your brand, to fit the way you do things, and/or to meet current or future instructional needs?
- What change management strategies will be needed?
- How much training will be required for students and instructors?
- Who will support students and instructors as they use the LMS?

Technical issues

- To what extent do you want a system to integrate with existing systems—registration systems, HR software, email systems, authentication processes, etc?
- Do you want to have the system hosted internally or would you prefer to outsource the hosting?
- How important is the support of standards (SCORM, AICC, IMS, etc.)?
- What kind of technical support can you provide? What will you expect of the vendor, hosting provider, or open-source community?
- To what extent is security (for students and data) a concern?
- Is it platform compatible (PCs versus Macs)?
- Will it work with all the browsers likely to be used without requiring special settings?
- Will it enable the uploading and downloading of files without difficulty?

QUESTIONS FOR INSTRUCTORS

(1) If you have never been involved with e-learning courses, would you be interested in developing and/or facilitating such courses? What tools do you believe you would need?
(2) Have you ever facilitated an e-learning/online learning course, blended learning course, or a face-to-face course supplemented by online activities?
   (a) If yes, are you interested in continuing to be involved in online courses?
   (b) If no, would you be interested in leading some online courses?
(3) Did you create the course yourself?
(4) Did you use an LMS as the platform for your course?
   (a) If so, which LMS did you use?
   (b) If not, how was your course delivered?
(5) Were you satisfied with the LMS that you used?
(6) If not, in what ways did you find it lacking?
   - hard to learn
   - features that were missing
   - too administrative, did not facilitate student learning
   - lack of support
   - took too much time
   - prefer other systems I have seen
   - other
(7) Would you be interested in trying another LMS?
(8) Did you use any other software to help in the creation of the course itself, course materials, activities, or assessment strategies?
(9) In a corporate environment, are you interested in selling the courses that you have created?
(10) What kind of training should be provided for instructors if we adopt a system?
(11) From the following list of features, choose the list of features that you have used:
   - assignment modules
   - branching lessons
   - calendar
   - chat
   - conferencing
   - course development
   - email
   - discussion forums
   - glossary
   - grade management
   - group projects, presentations, and management
   - student progress tracking and management
   - student self-evaluation
   - student surveys
   - quizzes
   - single-question polling
   - wikis and blogs

   (a) Have you used these and would you use them again?
   (b) What features were most useful and least useful?
   (c) What other features would you like to see?

(12) Can you describe a successful and an unsuccessful online learning initiative?

QUESTIONS FOR STUDENTS

(1) Have you ever taken an online course, blended learning course, or a face-to-face course supplemented by online activities?
   (a) If so, would you do it again?
      (i) If so, why?

(ii) If not, why not?
(b) If not, would you be interested in trying it?
(i) If so, why?
(ii) If not, why not?
(2) Was the online learning environment easy to use and to find your way around?
(3) Did you receive any training in the use of the systems?
(a) If so, was the training sufficient?
(b) If not, were any support materials available for training yourself?
(c) In either case, what would you recommend for training?
(4) From the following list of features, choose the ones you have used.
- assignment modules
- branching lessons
- calendar
- chat
- conferencing
- course development
- email
- discussion forums
- glossary
- grade management
- group projects, presentations, and management
- student progress tracking and management
- student self-evaluation
- student surveys
- quizzes
- single-question polling
- wikis and blogs

(a) Have you used these and would you use them again?
(b) What features were most useful and least useful?
(c) What other features would you like to see?

(5) Describe your experience
(a) What did you like best about the experience?
(b) What did you like least about the experience?
(c) What suggestions would you make?
(6) Be prepared to ask and record open-ended questions. Prompting may be necessary, especially for students. For example, you might ask whether they were able:
(a) to work by themselves
(b) to work in small groups over distance
(c) to work on their own schedule
(d) to redo portions of the coursework
(e) to keep to deadlines

A needs assessment checklist for educational institutions is available at http://www.caucus.com/inf_needs.shtml
A needs assessment checklist for corporate LMSs is available at http://www.geolearning.com/needs

Appendix G: Request for proposals questions

QUESTIONS FOR LMS VENDORS AND HOSTING PROVIDERS

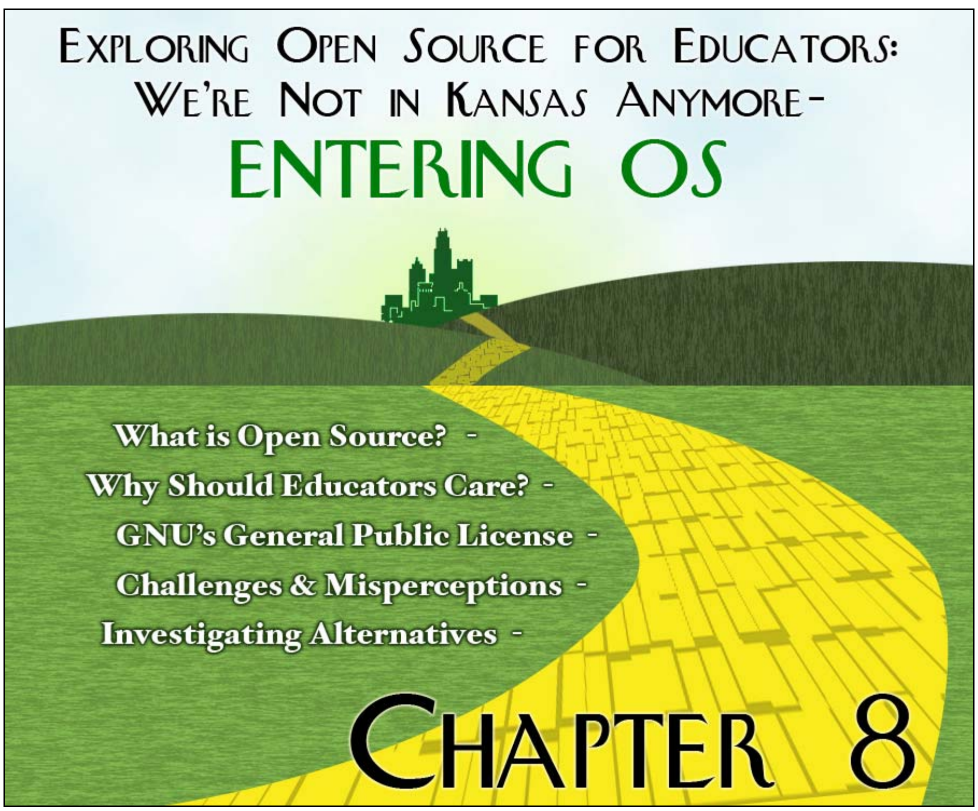
(1) List all of the features you are looking for with priorities indicated. Be sure to include reporting functions and capabilities. How and to what extent does the vendor's product implement the features that you have on your list?
(2) What is the cost? The costs of LMSs vary by a factor of more than 10 to 1, from roughly $10,000 to $200,000 and even more. Be sure to identify clearly what functionality, implementation costs, technical support, upgrades, etc., you are paying for. There are several different costing models: leasing, one-time purchase, annual subscription, fixed cost based on size of organization, variable cost based on number of registered users, based on the number of administrators who need access to the system, etc. Explore all the possibilities, and negotiate.
(3) What are the hosting options: in-house hosting, vendor hosting, third-party hosting?
(4) What are the Implementation issues? How much support does the vendor provide, and what are the costs? Ask specifically about post implementation technical and customer support.
(5) List the third-party systems and courseware that you will be using and ask the vendor about their experience with these products. If you have in-house developed courseware ask if you can test it with their LMS.
(6) Obtain references from other companies that have used the LMS especially from those organizations similar to your own. Different vendors target different industry sectors and size of implementations.
(7) Will they be available to demonstrate the software in-person or online? Will they demonstrate according to scripts you have developed which reflect your own working scenarios?
(8) Is it possible to arrange a free trial or small pilot?

A free template for an RFP for a learning management system is available at. www.geolearning.com/rfp. They also have a number of other very useful resources available.

8
Exploring Open Source for Educators: We're Not in Kansas Anymore – Entering OS

Julia Hengstler

It should come as no surprise that the pressures of cost reduction are motivating organizations to incorporate open source technology into their IT architectures … The real problem is widespread unfamiliarity and lack of expertise with open source across all levels of the organization. – Fima Katz, CEO of Exadel (as quoted by Vworld New Media, February 7, 2006)



Learning outcomes

After completing this chapter, you should be able to:

- Define open source, free software, and freely sourced software.
- Explain the importance of the Open Source and Free Software Movements.
- Locate repositories of open source and free software on the Internet.
- Cite examples of educationally relevant open source and free software.
- Explain the impact of educational software provider mergers and educational patents and the importance of freely sourced alternatives.
- Discuss legal issues around some licensing structures.
- Discuss the barriers and catalysts for widespread adoption of freely sourced software.
- Explain three common misconceptions regarding freely sourced software.
- Propose, plan, and implement an investigation of freely sourced software alternatives.
- Differentiate between copyright and "copyleft".

Introduction

> "Lions and tigers and bears! Oh, my!" – Dorothy, *The Wizard of Oz* (Langley, 1939)

Though relatively new to our collective consciousness, open source is a phrase tied to some of the more powerful words in our global history—innovation, evolution, movement, revolution—but the forerunner and mate of open source is free software, and by extension, the Free Software Movement. Both movements champion public access to source code. This is so important because software technology is an essential tool for progress on so many fronts, and the Internet has played a significant role in the democratization of information. DiBona, Ockman and Stone (1992) use the following analogy:

Imagine for a moment if Newton had withheld his laws of motion, and instead gone into business as a defense contractor to artillerists following the Thirty Years' War. "No, I won't tell you how I know about parabolic trajectories, but I'll calibrate your guns for a fee." The very idea, of course, sounds absurd (p. 11).

Richard Stallman, father of the Free Software Movement, GNU[8] and the General Public Licence (GPL), says, "[That] is an understatement. Compared with software in 2000, physics in 1700 had a very small role in affecting people's lives" (personal communication, September 11, 2006 12:58 PM).

What is open source or free software ?

Open source as a term has only been in existence since 1998. Prior to that, and running parallel with that term, has been "free software".[9] Lately, open source has become the more generic public term. For Stallman and his Free Software Movement, the highest premiums have always been placed on personal/collective intellectual freedom, and he holds fast to the term "free software". He says, "Proprietary software is a social problem and our aim is to solve the problem" (Stallman, personal communication, September 10, 2006). Stallman also says, "In nearly all cases, the software which is called 'free' is also open source, and the software which is called 'open source' is also free (though there are occasional exceptions to the latter). The difference is a mainly matter of the philosophy that the speaker endorses" (personal communication, September 10, 2006). At its most basic, open source and free software mean that the coding for an application or software has been made freely available to the public. It's the *why* of that action where things get tricky. For that reason, I refer to both types of software collectively as "freely sourced".

The spirit of freely sourced software is the spirit of collaboration in much the same way collaboration is meant to drive Web 2.0—code is revealed for people to use it, modify it and share the program/application with others. We see behind the curtains, and anyone can tinker with the Wizard's machine, add to it, make it better, and redistribute it. In this way, freely sourced programs evolve through collective efforts. It is both evolutionary and revolutionary in those respects. Open source and free software applications are constructivist in nature. Due to wide ranging and rapid input from

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[8] "GNU is a recursive acronym for "GNU's Not Unix"; it is pronounced guh-noo, approximately like canoe." (Free Software Foundation, Inc. 2007)

[9] This is not to be confused with "freeware" which although free, and redistributable, generally does not make source code available (Stallman, R. M., personal communication, September 11, 2006 7:13 AM).

programmers around the world, software development time can be condensed and programs become far more responsive to users' varied needs. Unlike proprietary commercial software, freely sourced applications are *designed* for user customization.

The Open Source Initiative [OSI] (http://www.oss-institute.org), one of the leading and guiding open source organizations, specified 10 characteristics for open source licensing:

- free redistribution;
- readily available and useable source code;
- permission for modification of the original code and derived works;
- conditions for maintaining integrity of the author's source code;
- equality of access regardless of person or group;
- equality of access regardless of field of endeavour;
- extension of original free distribution rights for subsequent redistributions;
- independence of, or extractable from, particular packages of software or hardware;
- licensing restrictions of the open source program do not automatically extend to additional software distributed along with it;
- non-restriction of the software to any type of technology or user interface so that it may be redistributed via means other than the Internet and may run in environments that do not allow for popup dialogue windows. (Open Source Initiative, 2006a).

As of April 2007, the OSI (2006b) approved 58 variations on open source licensing, among them the General Public Licence (GPL) (Free Software Foundation, Inc., 1991) of Stallman's Free Software Foundation, Inc. (FSF) (http://www.fsf.org/).

This doesn't mean that open source software is completely non-commercial or non-proprietary: open source (as opposed to free software) varies according to the extent of its proprietary-nature and levels of commercialization. Jive Software (http://jivesoftware.com) is a company providing instant messaging software that institutions can leverage to provide real-time contact between instructors, students, and any other users, especially useful for tutorials and collaboration. Jive dual-licences its communication server, Openfire (formerly Wildfire) first as Open Source General Public Licence (GPL)[10] by providing access to source code, modification, and redistribution rights *and* second as a commercially licensed "Enterprise" version (Jive, 2007).

Two major repositories/directories of freely sourced software and applications are the Free Software Directory (http://directory.fsf.org/) and Sourceforge.net (http://sourceforge.net/). SourceForge boasts a repository of over 100,000 projects and claims the "largest repository of open source code and applications available on the Internet" (Open Source Technology Group, 2006). Here you can find Pidgin (http://www.pidgin.im/), an interoperable instant messaging application, and DotNetNuke (http://www.dotnetnuke.com), a framework for "creating and deploying projects such as … websites, … intranets and extranets, online publishing portals, and custom vertical applications" (DotNetNuke, 2006a). If you're of a more technological bent, and speak "programmer", you might use Koders.com (http://www.koders.com), the self-proclaimed "leading search engine for open source code" (Koders, 2006).

Why should educators care?

Increasingly students are demanding more flexibility in the delivery of courses. As more schools are adopting distributed learning approaches, software and technology have been central. One tool for course delivery is a learning content management system (LCMS) or virtual learning environment (VLE). The current state of the LCMS or VLE field underscores the importance of freely sourced options. Recent commercial mergers, acquisitions, and the rise of educational patents (EduPatents) have created an unstable environment where open source and free software options may in fact be *less* risky from both financial and legal standpoints, not to mention from the standpoint of ensuring intellectual freedom as advocated by Stallman (personal communication, September 10, 2006; Williams, 2002). Jim Farmer (2006), consultant to the US Department of Education and author of an upcoming report on open source communities for Oxford University, warned that "Education patents and the new licensing environment may further commercialize teaching and learning."

Blackboard (http://www.blackboard.com) is a case in point. Over the last four or five years, Blackboard has consolidated its market share to become one of the largest proprietary commercial entities in the field. In January 2002, *The Chronicle* reported on the Blackboard-Prometheus merger, saying it was "the fifth acquisition for Blackboard since its founding in 1997, and three of those were companies originating in academe" (Olsen & Arnone, 2002). Four years later in January 2006, Black-

[10] This is a separate licence not to be confused with GNU's General Public Licence or GPL.

board bought-out competitor WebCT (http://www.webct.com) for an estimated $154,000,000 US (Helfer, 2005), making it one of the major forces in LCMS/VLE provision. (Keep in mind that WebCT also originated in academe, beginning life at the University of British Columbia, Canada.) Helfer (2005) wrote,

> In 2004, many customers of Blackboard and WebCT received rather sizable cost increases to renew their software licenses. Questioners of the merger are concerned that decreased competition may mean increased costs to customers. The merger doesn't necessarily mean the new Blackboard will squash all competition, however.

[Blackboard's proprietary commercial competitors were listed as ANGEL Learning (http://www.angellearning.com), Desire2Learn Inc. (http://www.desire2learn.com) and IntraLearn Software Corporation (http://www.intralearn.com/) (Helfer, 2005).]

Helfer's (2005) optimism may have been misplaced. In January 2006, around the time the WebCT buy-out was finalized, Blackboard filed for a US patent for "Internet-Based Education Support System and Methods" which it received in July 2006 (Mullins, 2006). Blackboard promptly sued Desire2Learn and followed with a flurry of international patent filings in Australia, New Zealand, Singapore, the European Union, China, Japan, Canada, India, Israel, Mexico, South Korea, Hong Kong, and Brazil (Mullins, 2006). This has caused a furor in educational technology communities, and is something about which we should all be concerned. A countermovement has been launched by some. As Feldstein (2006) writes, "patents can be invalidated if one can demonstrate that the claimed invention was in public use or described in a published document prior to the date of the patent filing." Various groups with vested interests—commercial, non-commercial, proprietary and non-proprietary—are seeking to establish *prior art* in bids to undermine Blackboard's patent claims. One such example is the Wikipedia site Michael Feldstein established for virtual learning environments (VLEs) on July 30, 2006 (Wikipedia, 2007). Feldstein (August 1, 2006) reported that while on July 30, 2006, the Wikipedia entry was "[only] a one-sentence stub" by August 1, 2006, was "a pretty good document that was generated by a variety of people". As of May 2, 2007, the same Wikipedia entry was extensive spanning from the pre-1940s to 2006 with terminology, references and further reading sections (Wikipedia, 2007).

Regarding Blackboard, Farmer (2006) wrote:

> The Blackboard patent is not alone, but representative of many that have been issued – and many more that are pending in the U.S. that could apply to any learning system. It is unlikely that all claims of all patents will be found invalid before someone wins an injunction or judgment, and cease and desist letters and license invoices follow. We should be prepared for a new environment of restrictions, licensing, and confrontation of our suppliers … Now any choice of software, any method of instruction, and any choice of content will have to be viewed from a new perspective of risk assessment. This moves the decision from teaching faculty to business officers and attorneys who are least prepared to judge the effect on education and research.

As the educational technology field struggles with Blackboard's attempts to secure a proprietary commercial future, the organization's actions repeat patterns earlier established by AT&T and Microsoft. The actions of these two large proprietary players were key drivers in the rise of both the Free Software and Open Source Movements. If educational software evolution continues to parallel the AT&T and Microsoft model, freely sourced software should play a central role in beating back monopolistic bids—as should GNU's GPL. Based on such a history, freely sourced learning platforms such as ATutor (http://www.atutor.ca), Sakai Project (http://www.sakaiproject.org), and Moodle (http://moodle.org) warrant watching.

Understanding GNU's General Public Licence—a legal bastion

> "The [GNU's] GPL has become a powerful force in the information age. A hack on the copyright system, it turns the concept of copyright upside down, creates a whole community cooperating around the world and enables the development of *software by the people, of the people and for the people.* Many new licenses were modeled after or influenced by the GPL". – Tai (2001)

Stallman founded the GNU Project in 1984 to create a free software operating system. GNU sought to replace the proprietary Unix platform which AT&T, with the help of Sun, was seeking to establish as the monolithic operating system for the industry. Hence the recursive name of the project, "GNU is Not Unix" (Free Software Foundation, Inc. 2007). In 1985, Stallman founded the Free Software Foundation, Inc. (FSF), a non-profit organization dedicated to supporting the free software movement in general, and the GNU Project in particular. Between 1984 and 1988, GNU and the FSF developed special licences for specific GNU programs (Tai, 2001). This licensing approach was eventually consolidated in February 1989 as the GNU General Public Licence (GPL) Version 1 (Tai, 2001). The GPL became the gold standard for ensuring the future of freely sourced software for a variety of reasons. First, the GPL protected user rights to free software by delineating responsibilities with regard to distribution, copying and modification of the software. While similar to earlier licences, the GPL was unique in that:

> if you distribute[d] copies of such a program, whether gratis or for a fee, you must give the recipients all the rights that you have. You must make sure that they, too, receive or can get the source code. And you must tell them their rights (Free Software Foundation, Inc., February 1989).

Here, Stallman ensured that any distributions would carry the original rights to distribute, copy and modify. This was further specified in Section 2.b stating that any secondary programming containing the original free work "be licensed at no charge to all third parties under the terms of this General Public License" (Free Software Foundation, Inc., February 1989). Thus, the GPL effectively prevented proprietary commercialization of the free programs. As opposed to "copyright", GPL became commonly known as "copy left."[11]

From the programmers' perspective, another critical aspect of GPL was that the licence ensured any distribution, copying, or modification would always make clear that the *originators* of the software did *not* provide any type of warranty with regard to the software. The GPL was updated as Version 2 in 1991 along with the release of a licence variation called the Library GPL. The second version of GPL included a section to counteract claims that users were unable to fulfill the GPL licence and were therefore not bound by the terms. GPL Version 3 is currently under discussion. Some new aspects have to deal with digital rights management issues, as highlighted in legal cases against peer-to-peer sharing of copyrighted materials.

Two additional licensing documents connected to the GPL are the Library GPL, or as it's now called, the GNU Lesser General Public Licence (LGPL) and the Free Documentation Licence (FDL). The LGPL was originally released in 1991 and updated in 1999 (Free Software Foundation, Inc., 1991/1999). It was developed to allow non-free software to interface with free software. Previously, under the terms of the original GPL, such an interaction would have made the "using" non-free software subject to the GPL (Free Software Foundation, Inc., 1991/1999). The FDL was added to the GPL legal library in November 2000. It was later revised in 2001 and 2002. The original intention was to align manual licensing requirements for GPL software with the GPL, but the licence scope is not limited to free software manuals. The FDL applies to "any manual or other work, in any medium" and ensures the work has "a world-wide, royalty-free licence, unlimited in duration" as long as the FDL terms are met (Free Software Foundation, Inc., November 2002). Similar to the GPL, with regard to the work in question, the FDL grants:

> everyone the effective freedom to copy and redistribute it, with or without modifying it, either commercially or noncommercially … this License preserves for the author and publisher a way to get credit for their work, while not being considered responsible for modifications made by others (Free Software Foundation, Inc., November 2002).

Through the GPL licences, Stallman and the FSF legally and successfully entrenched the ethical obligation to keep free software and any derivative works free. Ultimately, many subsequent agreements, like those among the 58 licences approved by the OSI (Open Source Initiative, 2006b) or The Debian Social Contract Version 1.0 (Software in the Public Interest, 1997) owe a great deal to the GPL. Stallman and Moglen said this of GPL in 2005:

> The GPL is employed by tens of thousands of software projects around the world, of which the Free Software Foundation's GNU system is a tiny fraction. The GNU system, when combined with Linus Torvalds' Linux—which has evolved into a flexible, highly portable, industry-leading operating system kernel—along with Samba, MySQL, and other GPL'd programs, offers superior reliability and adaptability to Microsoft's operating systems, at nominal cost. GPL'd software runs on or is embedded in devices ranging from cell-

[11] While copyright prevents free distribution, copying and modification of intellectual works, or *copyleft,* assured the opposite.

phones, PDAs and home networking appliances to mainframes and supercomputing clusters. Independent software developers around the world, as well as every large corporate IT buyer and seller, and a surprisingly large proportion of individual users, interact with the GPL.

Enforcing the General Public Licence

Maintaining the legal power and influence of the GPL has become the focus of one recent project, gpl-violations.org (Welte, 2006a). This is a GPL watch-dog group founded by Harald Welte in 2004 (Welte, 2006b) whose actions to date have primarily focused on violations by businesses active in Germany and Holland, as well as the rest of Europe, although many of the parent companies may be elsewhere. Welte became concerned about GPL enforcement around 2003 when he discovered GPL'ed software he had written to work with the Linux kernel (netfilter/iptables) was being used by companies in a manner violating the licence (Welte, 2006b). According to the project site: "After some time … [Welte] discovered that the number of GPL violations was far bigger than expected, as is the number of Free Software projects whose copyrights are mistreated/abused" (Welte, 2006b).

As Welte investigated, he found "more and more cases of infringement … mostly in the embedded networking market" (Welte, 2006b). By mid-2004, Welte's project had secured its first preliminary injunction in favor of the GPL (Welte, 2006b). From there, Welte's work branched out. He began to protect other developers' GPL'ed work that was similarly abused (Welte, 2006b). He gained financial backing from Linux developers like Werner Almesberger and Paul "Rusty" Russell who "transferred their rights in a fiduciary license agreement to enable the successful gpl-violations.org project to enforce the GPL" (Welte, 2006b). The companies that gpl-violations.org claim have violated GPL terms are not necessarily small companies. On March 14, 2005, Welte delivered a warning letter to 13 companies, among which were listed Motorola and Acer (Welte, 2005/2006). In September 2006, the organization won a case against D-Link Germany GmbH, a subsidiary of Taiwan's D-Link Corporation (Welte, 2006c). Other cases, settled out of court, have involved "Siemens, Fujitsu-Siemens, Asus and Belkin" (Welte, 2004/2006). As of June 2006, Welte's project claimed successful completion of 100 infringement cases: "Every GPL infringement that we started to enforce was resolved in a legal success, either in-court or out of court" (Welte, 2006b).

In a 2006 legal case of another sort (amended from earlier actions), David Wallace claimed that the FSF—through the GPL—was acting as a monopoly with regard to operating systems under the US Sherman Anti-Trust Act (Wallace v. Free Software Foundation, Inc., March 20, 2006). In an ironic twist, Wallace charged that the GPL was "foreclosing competition in the market for computer operating systems" (Wallace v. Free Software Foundation, Inc., March 20, 2006, p. 2). In reviewing the complaint, the court found that Wallace's "problem … [appeared] to be that GPL generates too much competition, free of charge" (Wallace v. Free Software Foundation, Inc., March 20, 2006, p. 5). In reviewing the nature of the GPL and the GNU/Linux licensing under this agreement, the court found, "the GPL encourages, rather than discourages, free competition and the distribution of computer operating systems, the benefits of which directly pass to consumers. These benefits include lower prices, better access and more innovation" (Wallace v. Free Software Foundation, Inc., March 20, 2006, p. 5). As Tai (2004) wrote, "The recent attacks on the GPL … demonstrate how far the GPL's influences have come, but we may not have seen the full impact of the GPL yet".

Challenges for widespread adoption

Those converted to freely sourced software in the last 10 years rank among Roger's (1983) early adopters. If Roger's (1983) model holds true for the open source and free software movements, we should expect a rapid upswing in adoption as we enter the early majority to late majority adoption phases. How quickly this will happen can be more readily explained through the Technology Acceptance Model (TAM) which looks at how perceptions about user friendliness and usefulness of a technology affect adoption over time (Davis, 1989). Another factor that will affect acceptance is simple awareness and knowledge of open source and free software. Potter (2000) cites some concerns people held with regard to freely sourced applications that tie in with Davis's (1989) TAM:

- product concerns: product viability and technical issues such as security, scalability, and technical support;

- contractual concerns: a purchase contract being signed with a company that did not create the product purchased; minimization of copyright for programmers;
- product support concerns: discomfort of software companies with providing warranties for products they did not create; short track records and unknown staying power of small new software companies with regard to the provision of long-term product support;
- product standardization concerns: due to the collaborative nature of source code, functionality, enhancements, and application alterations can be added at will and marketed as a different or newer versions of the program so, "The multiplicity of products and versions can result in incompatible systems and inconsistent products".

While Potter's (2000) concern about application alterations or proliferation of versions can *seem* worrisome, once a freely sourced program is running on your system, under your administration, only the people you (or your system administrators) designate have the permission to access and modify the source code. If you want to switch to a newer version, you are free to do so—but are not compelled to do so. No one else will be able to tinker with the code you've installed on your hardware unless given such permission and no one can force you to upgrade through contractual or licensing obligations. This does not mean that an unscrupulous programmer could not hide something in the source code to allow him or her to go in and modify the program without your knowledge, but that is highly unlikely if you've selected a reputable program with robust user and programmer communities. In these communities, people constantly scrutinize the code. Such issues would be quickly discovered and the program panned in reviews, blogs, or other formats.

Another barrier to adoption can be the perceived portability of data from existing software to a freely sourced option. Often many of the difficulties in migrating an instructor or institution's data to a new platform are attributed to the software, and at one time that was true. In the past, proprietary commercial programs ensured portability of content between *their* versions, with little reference to others. For example, with regard to learning platforms, many institutions developed courses, media, or data without reference to design documents or data tagging, perhaps never envisioning they would contemplate migration to a different software provider. A course designed by one instructor was often significantly different in structure from that designed by another. Materials showed little consistency in design or layout.[12] Since the standards movement, the issues of portability and interoperability have become central considerations when selecting software. Consequently, consistent course design and layout have gained importance in the educational environment. More frequently, instructors or other developers are being trained in ways to build standards compliant courses. It's far easier to build a software program to move content to a new environment when the parts are common, properly identified, and in the similar locations. Even if you don't have the technological expertise within your institution to build the necessary migration software, with standard compliance, good design and foresight at the outset, that process can be outsourced for a reasonable price.

These are not the only obstacles to free and open software—other threats loom. Recently there have been movements afoot to effectively and legally prohibit reverse engineering of software. Potter (2000) discusses recent drafts of the Uniform Computer Information Transactions Act (UCITA) saying:

> Currently, reverse engineering is legal for reasons of "interoperability" between computer systems. Prohibiting reverse engineering inhibits the development of open source [and free software] because for … [freely sourced software] products to be of any value, they must be compatible with other computer applications. The way to establish compatibility is to reverse engineer the other developer's code … advocates are concerned that the UCITA will allow proprietary developers to "establish secret file formats and protocols, which there would be no lawful way for [programmers] to figure out".

Furthermore Potter (2000), identified problems with legal drafts of the UCITA that would entrench implied warranties into software licences. Traditionally, freely sourced software does not provide warranties unless expressly specified by an individual or company. This has been a benefit as it lowers the risk of lawsuits. Consequently, this creates low entry barriers to new software designers and companies. With no prerequisites of insurance or legal representation to limit liability, anyone and everyone can contribute to programming the soft-

[12] This is still true of institutions in the early stages of online course development as their emerging understanding has not yet extended to the need for templates, structures, and data tagging to ensure future portability and interoperability with other platforms.

ware. Potter (2000) states, "Placing the risk of litigation on the open source [or free software] developer may in turn increase the price of … products. Another negative consequence is the possible deterrence of programmers from contributing useful code".

Since the end of Unix market control, another major barrier to freely sourced software has been Microsoft domination. C. DiBona et al. (1992) write, "The question really is not whether venture capital funding will flow to Open Source, but why the flow has only begun to trickle in that direction … Why did it take so long to catch on?" (p. 10). They go on to answer this question:

> Taking a look at the computing landscape, you've got a situation where a very large company with very deep pockets controls the lion's share of the commercial market. In Silicon Valley, hopeful applications vendors looking for backing from the angel and venture capital community learn very quickly that if they position themselves against Microsoft, they will not get funded. Every startup either has to play Microsoft's game or not play at all. (C. DiBona et al., 1992, p. 10)

According to DiBona et al. (1992), programmers forced to play the Microsoft game are locked into the goal of assuring the proprietary nature of their work—"the goal of making the program completely dependent on Microsoft libraries … making any Windows native program very difficult to port to other operating systems" (p. 10). The author's also point out that one of the main reasons Microsoft has not dominated the Internet has been the Net's dedication to "a powerful collection of open standards maintained on the merit of individual participation, not the power of a corporate wallet" (C. DiBona et al., 1992, p. 10). The authors point out, that just like the Internet, free and open source developers "compete based on open standards and shared code" and generally work towards compatibility (C. DiBona et al., 1992, p. 10). Recently, it appears that the freely sourced movements have affected even Microsoft's strategies. In September 2006, Microsoft promised "not to enforce patents for technology in Web services specifications, which are used in connecting applications in service-oriented architectures and other forms of standards-based distributed computing" (Gonsalves, 2006). Gonsalves (2006) goes on to say that this was done in an effort by Microsoft "[to] help promote widespread adoption of Web services, which play an important part in how Microsoft ties its software to its own products and other applications" by targeting "developers and customers working with commercial or open-source [/free] software."

While community building and interpersonal relations have been a significant factor in the success of freely sourced software, other aspects help propel its increasing acceptance. Potter (2000) said:

> Economically, open source [/free software] is a more efficient way to allocate the benefits of copyright to society. Because current software protection law benefits relatively few developers, there is a need for change. Open source [/free software] exhibits valid, economical, and marketable alternatives to proprietary software development and distribution.

These reasons listed by Potter (2000) make open source and free software an increasingly popular choice. For example, Apache server, an open source application with over 11 years in the industry, is now used by more than 62 percent of the top developers in the server industry. In comparison, Microsoft holds less than half of the market share at roughly 30 percent (Netcraft, Ltd., 2006). Apache's market share increased from its February 2002 estimate at just over 58 percent (Netcraft, Ltd., 2002). In addition, interest in other open source and free software is growing. A March 2005 article, "Estimating the Number of Linux Users (or: why we think we're 29 million)" did a review of Internet hits in February 2005 as recorded by Teoma and Google (combined). The results are summarized in Table 8.1, Open Source vs. Windows Interest by Internet Hits.

Table 8.1. (Adapted from "Estimating the Number of Linux Users (or: why we think we're 29 million)" (Linux Online, Inc., 2006)

Operating System	**Hits**
Linux + linspire	269,000,000
Solaris	27, 000,000
*BSD	55, 000,000
Total Freely Sourced	*351,000,000*
Win3.1/95/98/2000/ME	88, 000,000
Win2003/Server	19, 000,000
WinXP	33, 000,000
WinNT	33, 000,000
WinLonghorn	33, 000,000
Total Windows	*206,000,000*

Clearly there is evidence of significant interest in open source and free software—if only measured at a shallow level by operating system interest or website hits.

According to Fima Katz, CEO of Exadel, "The real problem is widespread unfamiliarity and lack of expertise with open source [and free software] across all levels of the organization" (V world New Media [Designs4nuke.com], February 7, 2006). A survey by Exadel conducted at the 2005 Gartner Open Source Summit found that "more than half (55%) of survey respondents reported that their organizations currently have limited internal knowledge of open source[/free software]" (as cited in V world New Media [Designs4nuke.com], February 7, 2006). Moreover, the February 23, 2005 Gartner report, "Positions 2005: Open-Source Solutions Will Restructure the Software Industry," found that "40 percent of respondents claimed that their organization's lack of knowledge about open source [/free software] as the top vulnerability to adoption" (as cited in V World New Media [Designs4nuke.com], February 7, 2006).

Despite the various barriers, current trends indicate that freely sourced software will flourish, as witness the proliferation of Apache servers, GNU/Linux operating systems, as well as ATutor, Sakai, and Moodle sites, To ensure this, Potter (2000) offers the following suggestions: formation of a non-profit and/or governmental body to certify interoperability and portability of freely sourced software; using freely sourced software code as a legal remedy for monopoly, anti-trust, and copyright suits; as well as government endorsement of freely sourced software through its own policies, adoption, and use.

The question then is: when, if ever, is it the right time for *you* to migrate to freely sourced software? Only a comprehensive contextual assessment of your situation, as well as increasing your knowledge of free software and open source, can help you make that decision. The next sections offer a possible methodology to increase your knowledge, and move from initial considerations of freely sourced options to implementing pilot projects and widespread organizational adoption.

Common misperceptions of the "Great" Wizard

> "The wizard? But nobody can see the great Oz. Nobody's *ever* seen the great Oz … Even I've never seen him!" – Guardian of the Emerald City Gates, *The Wizard of Oz* (Langley, 1939)

Just as Dorothy, the Tin Man, the Lion and the Scarecrow held misconceptions of Oz's Wizard, there are many misconceptions about open source and free software. Some of the most common of these are (1) freely sourced programs have no costs; (2) freely sourced programs are of low quality; and (3) freely sourced programs can't compete with proprietary commercial applications.

MISCONCEPTION 1: NO COST

As a point of clarification, *source code* is free in open source and free software applications. Chances are, though, you will still need someone or several people with technical know-how to install them, run them, tweak them, update them, etc. Sometimes the original developers provide this kind of support for a price. One example of this is ATutor (http://www.atutor.ca), a Canadian open source content management system for course delivery developed at the University of Toronto and licensed under GNU's GPL (Adaptive Technology Resource Centre, 2006). ATutor claims to be, "the first inclusive LCMS complying with … accessibility specifications at the AA+ level, allowing access to all potential learners, instructors, and administrators, including those with disabilities" (Adaptive Technology Resource Centre, 2006). ATutor also complies with "W3C XHTML 1.0 specifications" so it is "presented consistently in any standards compliant technology" (Adaptive Technology Resource Centre, 2006). It allows for content portability by compliance with "IMS/SCORM Content Packaging specifications, allowing content developers to create reusable content that can be swapped between different e-learning systems" (Adaptive Technology Resource Centre, 2006). If you need help with the technical end of things, you can purchase varying levels of ATutor support, from one-time installation to course hosting and individualized consulting.

Recent mergers of commercial proprietary businesses have made it difficult to accurately reflect current fees for similar proprietary commercial service provision. Actual amounts vary based on enrollment volume as well as bargaining power of a purchaser. Available information can give us a rough idea of current price points. A posting by Michael Penney (July 29, 2005), Learning Management System Project Manager for California State University, Humboldt, cited basic Blackboard institution costs as follows for 7,500 course enrollments: a base fee of approximately $7,000 US, $4,000 US for encryption, and $0.75 US per enrollment for MSSQL ($5,625 US/7,500 enrollments). This would total approximately $16,625 for 7,500 course enrollments—*exclusive of any content or course development*. Blackboard can provide some economies of scale compared to other commercial proprietary platforms like eCollege (http://www.ecollege.com). During the same period, eCollege reportedly charged between $70 and $100 US per course enrollment per term for a fully hosted solution (Wright, August 2, 2005). Unfortunately, for smaller institutions or pilot projects—economies of scale don't apply. While exclusive Blackboard or eCollege licences may be too costly, pooling with other small users could make costs manageable. In some instances, this has lead to the creation of licence brokerage/consolidation. One example of this is Open School's (2006) Online Consortium in British Columbia, Canada. This consortium brokers WebCT licences for its members. Even with brokers, licensing can still be expensive for a small pilot. An institution or group's return on investment can be much more promising using a comparable freely sourced product like Moodle, Sakai Project, or ATutor, especially when leveraging in-house technological expertise.

In addition to up-front costs, and unlike proprietary commercial competitors, freely sourced learning platforms have no charges for upgrades other than the resources already committed—no new licences to buy or renew from year to year. While a certain amount of technological knowledge and skill is necessary to deploy a freely sourced option, that is just one component necessary for successful adoption. Appropriate hardware capable of running the programs, as well as appropriate connectivity, or access to it, are also necessary. So, while you may not pay for the program, you may pay for the necessary hardware (computer, server, etc.), and possible Internet service upgrades (depending on what you are planning to do), as well as the technical expertise to leverage it.

Many times, these key elements of technological experience and hardware are already present in your school or institution. Maybe you're a programmer yourself. In that case, you are able to leverage the power of open source and free software right now. If you have the hardware and Internet services necessary to run the programs, you are even farther ahead. Schools and institutions without these advantages will need technical support to deal with program source code. Most organizations like public schools, post-secondary institutions or small to medium-sized private schools have at least one technology employee with programming experience already working for, or contracted to them. Generally, people with programming experience are already converts to open source and free software thinking. The issue then becomes how much of the employee's time can be assigned to a freely sourced project.

If you are thinking about seriously investigating freely sourced options, your best bet is to have a technology expert from your organization, and some potential end-users (known early adopters of technology) review possible alternatives for considerations such as ease of installation, implementation, data conversion, and use. Keep in mind that freely sourced technologies are evolving rapidly. (This is one of the major problems, and worthy of a little more discussion). Be sure to revisit open source and free software as alternatives for your software/application needs periodically, and consider making freely sourced options a standard element of your regular software reviews. As for existing hardware needs, those will be based on the type of programs you want to run, who will access them, and how. If you determine that freely sourced software will work for you, and you will be moving people from proprietary commercial platforms to open source and free software options, you will need a change management plan. This is one of the key strategies for lasting conversion. The topic of change management is beyond the scope of this chapter, however. For this aspect of migration, I strongly recommend John P. Kotter's *Leading Change* (1996). Ultimately, open source and free software programs are low cost, rather than no cost, alternatives to proprietary commercial products.

MISCONCEPTIONS 2 AND 3: LOW QUALITY AND INABILITY TO COMPETE WITH PROPRIETARY COMMERCIAL PRODUCTS

Quality assurance in open source and free software is primitive and rudimentary: if people like it, they will download it, use it, develop it and redistribute it; if they don't like it, they'll ignore it or pan it in reviews. In this arena only the fittest survive. Freely sourced programs and applications are usually a labour of love. People develop them because they *like* to. In fact, many freely sourced applications are quickly approaching the ease of use and status of proprietary commercial products: evidence the increasing adoption of GNU/Linux ("Linux") as an operating system. Paul Graham (2005), a premier online developer and writer, compared the infiltration of freely sourced software into the market as "the architectural equivalent of a home-made aircraft shooting down an F-18". According to Graham (2005), freely sourced software can teach business three main lessons: "(1) that people work harder on stuff they like, (2) that the standard office environment is very unproductive, and (3) that bottom-up often works better than top-down". A sure harbinger of increasing quality is the notice commercial proprietary developers are paying to open source and free software programs. A review of the rise of the Free Software and Open Source Movements demonstrates that viable freely sourced software is possible.

Theoretically, freely sourced applications are "disruptive technologies" ala Clayton Christensen's model (2000). Christensen (2000) theorized that established businesses focus their efforts on sustaining and extending the lifespan of existing innovations. These established competitors focus their capital on the most profitable products and target markets while disruptive technologies attract low end or new markets, usually by creating less expensive, more user friendly versions of existing products (Christensen, 2000). Christensen revealed that established organizations "are almost always motivated to go up-market rather than to defend these new or low-end markets, and ultimately the disruptive innovation improves, steals more market share, and replaces the reigning product" ("A Conversation with Clay Christensen", n.d.). By the time the established competitor realizes the strategic error, it is too late: the disruptive technology emerges the winner.

The disruptive innovation model suggests that the strategic timing for disruption is when the target market demands for increased technology performance outstrip the established business's commitment to additional development (Christensen, 2000). Innovative competitors must be more nimble and responsive than established competitors (Christensen, 2000). Freely sourced software is, by definition, highly responsive to user needs, both current and emergent, and extremely nimble in responding to them. If we were examining it from the perspective of purely commercial competition, freely sourced software might be hampered by slow profit return, but freely sourced software is not generally in the business of profit, or at least not from the program code itself. The area in which it is weakest is in the ease of deployment. That said, development of freely sourced educational software continues at a rapid rate, making it easier for non-specialists to deploy. Moodle provides an example of a disruptive educational technology leader. In early 2004, Moodle (2007a) sites numbered less than 1,000. By August 2006, the number of sites approached 15,000 (Moodle, 2007a). In 2005, the Moodle community developed its own ezine, Moodlezine (http://playpen.monte.nsw.edu.au/newsletter/index.php). In 2006, William Rice (2006) published the book, *Moodle E-Learning Course Development*. Moodle (2007b) currently claims a registered user-base of 24,966 sites in 176 countries. For comparison, in 2007 Blackboard claimed a global user base of more than 3,650 clients spread across 60 countries and 2,200 institutions (Blackboard Inc., 2007a, 2007b).

The appeal of freely sourced software reaches beyond the budget constraints of academia. DotNetNuke is used by the New York Stock Exchange's NYSEData.com, the Utah Humane Society, the National Rugby League of Australia, and the British Columbia Soccer Association (Canada) (DotNetNuke, 2006b). The Magnolia Content Management Suite (http://www.magnolia.info) is used by private companies, the Spanish Ministry for Public Administration, the Open Web Application Security Project, as well as the University of Basel, Switzerland (Magnolia International Ltd., 2006). In the future, expect open source and free software applications to give commercial proprietary players a race for your money. For a migration framework, read on.

Meeting the Wizard and his machines: investigating freely sourced alternatives

Remember when Dorothy, the Tin Man, the Lion and the Scarecrow approached the Wizard of Oz? In each case they already knew what they needed. They had done their own rough needs analysis. To think about migration to freely sourced software, you need to start from a needs analysis perspective as well. This migration framework parallels a planning model used to locate a factory or centre of production. When situating such a business, planners need to weigh access to raw materials/product markets, costs of transportation for raw materials/products, as well as any special requirements such as particular energy sources, or research and development centres. Depending on the identified needs, some industries are materials-oriented (situated closer to raw material sites), some market-oriented (situated closer to markets), some transport-oriented (situated closer to the means of transportation) and others energy or research oriented (situated closer to sites like hydro-electric dams or university research centres) (Dunlop, 1987). Your job is to discover if open source or free software provides a viable alternative to relocate your needs.

When a potential adopter looks at changing software, a form of triangulation has to occur, factoring in the following:

- **Availability and comparability to current proprietary commercial software**—This first consideration has to do with knowing what types of software are currently available. As this information changes almost daily, you need to stay current with developments in freely sourced software. The closer the freely sourced and proprietary software programs are in terms of look, user friendliness, features and functions, the smoother the transition and the quicker the adoption. In addition, if the new open source option can approximate or better the old product while delivering desired, voiced needs for upgrades, the more assured the transition.

- **Software viability**—Here you review what version was being considered, how long the program has been around, and how robust a user community and/or commercial community has been built around the product. Certainly, products like Moodle, ATutor, and Sakai are safer bets. Experience has shown that the longer-lived and more robust the communities are, the more successful the freely sourced software will be.
- **Implementation and support costs**—Remember that while the source code is free, you have to have the expertise to deal with it. This includes not only necessary hardware purchases, but the skill to implement and support the software in your group or institution, or the cost of any necessary outsourcing.
- **Level of customization desired**—Unlike proprietary software, freely sourced software is highly customizable. You must know what you want from the software application. If customization is desired, key questions include: is there existing, budgeted expertise in our organization to accomplish customization through modifying programs? or would this work need to be outsourced, and at what cost?
- **Software succession history**—Generally, when organizations undergo a rapid succession of software transitions that involve significant changes/challenges, resistance to adoption of any new software will increase. Your transitions must be managed for the relative comfort of your users.
- **Risk assessment**—This involves an examination of how much risk is acceptable in a transition to freely sourced options. This may be measured by reliance on reputation, availability of warranties, or assumption of liability for the software. If low risk is desirable, then a group or institution can experiment with more established applications, or those with warranties and/or vendor support. If a program plays a critical role, then high software viability, usually at a higher cost, must be sought. The level of risk assumption you are willing to make will affect whether your group or institution will be comfortable with newer, less tried-and-true programs, or a blue-chip program like Moodle or ATutor.

NEEDS ANALYSIS

First you need a team or individual in your group or institution best positioned to do a software review. This is probably the person(s) responsible for buying, maintaining, and monitoring your technology. You want to look at the applications you are currently running in your organization. Determine which ones are the most expensive, have the most associated costs for upgrades, maintenance, etc. Which ones do your people complain about, or wish were better? For which ones do people request alternatives? When you've established a base list, examine these programs for the functions and features your users need, the ones they don't use, and the ones they wish the programs had. Use this to create your wish-list of functions and features for a freely sourced alternative. This list will form the foundation for a software analysis grid when you review your software options.

- **Outputs**: Needs analysis report—formal or informal; wish lists of software functions and features.
- **Resources**: Technology employee time for analysis.
- **Costs**: Employee wages for needs analysis time.

RESEARCH AND ANALYSIS

Now it's time to find out if there is anything in the freely sourced world that could meet most of the features and functions on your wish list. Build a research team: invite a technology expert(s) with programming experience from your group or institution to work with your needs analysis group (they could be one and the same) as well as one or more potential end users who are demonstrated early adopters of technology. End users might be clerical staff, instructors, teachers, accountants, etc. Always keep in mind exactly *who* will end up using the software. Ultimately, they will have to be satisfied with the new software. Sometimes your team may only consist of two or three people, and that's fine to start, but you will need to increase your participants in subsequent stages. Feedback from the end users is vital. If the interface—the front end of the application—is too challenging to use or user *un*-friendly, or clearly outweighs other benefits, look for something else, have it developed or wait until it is developed. Keep in mind, many user communities will take requests that build up over time to drive the direction of software development.

Have the team research possible alternatives for use in your organization in light of the needs analysis conducted and your wish list(s). Part of this process should assess viability of freely sourced alternatives including existing hardware and potential costs of new hardware or outsourcing. It should also generate estimates of technology support time required for migration to the new software for initial testing. Another important aspect of assessment is the development/support community for the specific program. Solid freely sourced applications have vibrant communities that support their use. You might also look at potential partner organizations with similar needs and aims who might contribute resources or otherwise support your migration activities. Using your wish list from the needs analysis stage, build a software comparison grid including any additional considerations you might have so that you can evaluate your options side by side. Depending on the item in the grid, you might have an X or check mark (to indicate an item is present) and/or a 1 to 5 scoring framework (e.g., for easy of use where 1 is most difficult and 5 is easiest).

If your team determines that there are viable freely sourced options, the next step in the assessment process is to create and submit a project outline with a draft budget to determine if your group or institution is prepared to commit more resources. Be sure to include meeting time for the project team to discuss the project, review reports, generate communications, etc. When drafting your budget, you should also prepare a rationale for a migration. Be sure to compare existing and projected costs of current proprietary commercial software/applications in use with implementation of the freely sourced options. Look at projected licensing costs for versioning, etc. Review the product versioning cycles of existing software to determine how often you are required to upgrade, and the associated costs. This is often a big selling point for conversion to freely sourced programs.

- **Outputs**: Comparison grid; research and formal or informal analysis report with organizationally specific recommendations; draft budget/cost including estimates from technology expert for migration of limited organizational data to freely sourced applications/programs.
- **Resources**: Employee project time for research and drafting proposal.
- **Costs**: Employee wages for research and analysis.

TRIAL IMPLEMENTATION

If you reach this stage, you have already determined that there are viable alternatives, and possible potential partners for converting to freely sourced software. You have drafted a proposal with a potential budget for conversion that has been accepted. Resources have now been committed to determine if freely sourced options will work for your organization. If you haven't already done so, designate a project manager or lead who will help draft schedules, track tasks, monitor budgets, etc. This is a critical position and will help keep the project on track. In a perfect world, this individual would have project management training or experience. During the first wave of implementation, you will probably test a set of select applications with your early adopters in limited deployments.

Initial testing might look at three to five applications for a week or month then narrow the field to just one or two options for a longer trial. The early adopters run the programs, comment on the benefits, pitfalls, etc., while working with the technology experts. Those periodic team meetings you budgeted for should guide the program pruning process. Be sure to get feedback from everyone: the people installing, maintaining and tweaking the source code, as well as the end users. Should the applications work well, these early adopters can become your professional development mentors who will then train other people to use the new software.

One of the results of this work may be a decision to abandon the trial software, but if you've found something that works well, you will need to communicate that news through your organization. Show people what you've done, how well it works, chat up the benefits of a wider conversion. Plant the seeds of interest in the new software and draft a project plan for wider organizational adoption. The project plan for the second phase of implementation should include a rationale, a budget, a change management plan, professional training/development, etc. For the fuller roll-out, you should definitely involve a project manager with experience who is skilled with managing organizational change. However, if the freely sourced options do not work for you at this time, provide a project close-down report indicating the issues with the software, but remember, freely sourced software will continue to develop, and new options will present themselves. Be open to further alternatives and research in the future.

- **Outputs**: Installation of programs/applications; limited conversion of organizational data to new programs/applications; training of select organizational personnel on new software/applications; meetings and periodic reports on challenges and successes with the new programs/applications; assessments of whether the project should continue/expand; project plan for wider organizational adoption, or report on the close-down of the project.
- **Resources**: Employee wages, including meeting time for project team; additional resources as designated in draft budget.
- **Costs**: Dependent on budget.

Conclusion

> "I've got a way to get us in there, and you're gonna lead us". – Scarecrow, *The Wizard of Oz* (Langley, 1939)

Ultimately, no one can tell you that open source or free software is better for you than your current proprietary and/or commercial products. Just like the journey to Oz, your journey to Os should be one of self-discovery. If you do hire a consultant, don't imagine you can hand-off the work and expect someone else to make a decision. People in your group or institution need to participate actively in that process. Open source and free software are constructivist theory in action, with the spirit of collaboration, and trickle-up thinking. If you want to adopt freely sourced software, if you want it embedded in your organizational culture, that culture may need to shift to embrace these values. You've already taken the first step: you've begun to educate yourself about your options. If you have a colleague or two with a similar interest, share this information with them. Like Dorothy, only you can find your way to Os and back, but remember that Dorothy had the Lion, the Tin Man, and the Scarecrow to help. There are lots of people out there ready and willing to help *you*—many of them for free! Imagine that.

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9

Quality Assurance by Design

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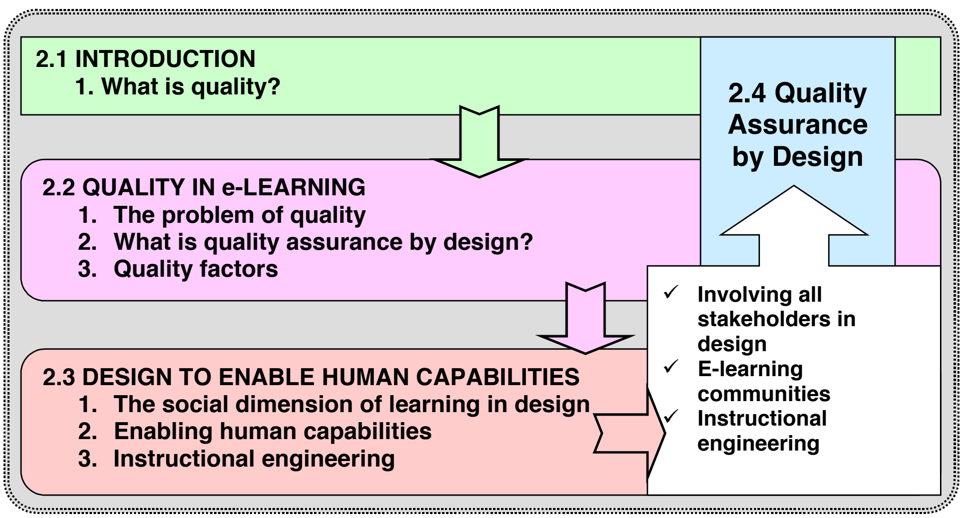
If we are to have viability and credibility in whatever quality assurance measures we adopt in the 21st century, we must open ourselves and the process to other stakeholders: the community, employers, professional organizations, peer institutions, and especially the students themselves. – Pond (2002)



Learning outcomes

After completing this chapter, you should be able to:

- Apply contemporary approaches to quality assurance and quality standards.
- Tailor quality assurance standards to the organization's needs.
- Identify quality by design, and apply best practices in an online setting.

Introduction

E-learning is characterized by the evolution of educational tools in a transitional period, that is, the use of computers for learning. The turn of the 21st century also suggests a turn from the Industrial Age to the Information and Collaboration Age, evident in the changes of people's life and work. E-learning has yet to be proved as an important form of learning, but this is a problem of e-learning quality.

To deal with this problem, organizations produce checklists and guidelines to ensure quality from the early stages of design. By applying predefined quality factors to educational systems engineering, quality can be ensured. This is what we mean by quality assurance by design: ensuring that mechanisms allow human capabilities to further expand. The mechanisms of e-learning engineering are:

- focus on pedagogical values such as individualistic or collaborative learning;
- identification, control, and elimination of inherent problems; and
- dynamic real-time evaluation.

Thus, the organization can protect the learner as a customer able to acquire the maximum benefit of e-learning. This chapter is intended to raise awareness of the importance of ensuring quality in the early stages of design and planning by:

- identifying the stakeholders' common goals;
- providing best practices and frameworks to every e-learner;
- identifying the effectiveness of quality improvement activities; and
- proposing frameworks to ensure quality by design.

Organizations in many countries now support open and distance education, starting with higher educational institutions and descending to secondary and primary education. E-learning has become increasingly importance because the Internet has facilitated the gradual elimination of time, space, and cultural boundaries. However, despite investments in technology and e-infrastructure, the high levels of interest among educators, and administrators, and policy makers worldwide, e-learning remains an unproven experiment (Cuban, 2003; Zaharias, 2004; Oliver, 2005).

In a survey on quality in e-learning, Cedefop, the European agency for vocational training, found that 61 percent of the 433 respondents rated the overall e-learning quality negatively as fair or poor. One percent rated it excellent, and five percent rated it very good (Massy, 2002). They gave several reasons for questioning e-learning quality. One of the common problems identified was the absence of performance signposts and measurements. Thus, learners are unmotivated and frustrated (O'Regan, 2003, Piccoli et al., 2003). Another problem was increasing plagiarism and a corresponding lack of original ideas (Culwin & Naylor, 1995; Lancaster & Culwin, 2004; Culwin, 2006). These results may be related to the absence of collaboration among stakeholders on a pedagogical level, and the operational level of systems engineering, both resulting in technocentric design.

In addition, the e-learning interface frustrates learners because of poor usability (Diaz, 2002; Notess, 2001). Since the focus so far has been more on the technological than on the pedagogical aspects of e-learning, there is need for useful and usable educational design in the e-learning environment (CHI SIG, 2001). One reason for this technocentric bias is that technology evolves much faster than its associated pedagogical approaches. In 2003, Laurillard identified a need for pedagogical perspectives, such as the focus on user interface, learning activities design, performance assessment, and an evaluation of whether the learning objectives have been met (Neal, 2003). Measurements for pre-, post-, and trans comparison of best practices are therefore essential.

Researchers are working on a design that can solve such quality problems (Muir et al., 2002; Zaharias, 2005). Nancy Parker (2003), acting executive director for external relations at Athabasca University,[13] refers to a lack of broad acceptance of online education in higher education as the new paradigm shift, as well as the lack

[13] Athabasca University has become the first Canadian university to be awarded accreditation by Middle States Commission on Higher Education (MSCHE), one of the six higher education regional boards in the US (http://www.athabascau.ca/media/releases.php?id=82).

of understanding of its particularities relative to the real classroom. E-learning, she claims, continues to foster the long-standing conflict in values between business and public services resulting from the absence of **quality assurance** (QA) policies.

Nowadays, quality control creates challenges to contemporary research, owing to its intangible dimensions. There are discrepancies between the traditional quality measures associated with accreditation or state-administered quality assurance frameworks and the new, emerging educational paradigm.

Quality in e-learning

THE PROBLEM OF QUALITY

Certain e-learning and pedagogical innovations have not succeeded in meeting a number of promises (Salmon, 2005), and have created confusion between the mere supply of information and actual knowledge-building and training (Barbera, 2004). Projects aiming at supporting e-learning environments such as UK eUniversity, NYU Online, Scottish Knowledge, Universitas 21, Global University Alliance (Garret, 2004), as well as a number of European corporate learning projects (e.g., StarScience, Dunes, Adapt-IT, Teachers-in-Europe, POLE STAR) have failed to realize many of their goals. However, the collapse of such initiatives does not indicate the failure of the e-learning concept per se, but rather the lack of quality. For example, lack of planning and marketing were the major reasons for the UKeU failure (Garrett, 2004.) The questions that arise include: What constitutes quality in e-learning? Why is it important? Are there ways we can ensure e-learning quality?

In general, quality refers to fitness of purpose. In e-learning, quality refers to learning (Stephenson, 2005), something excellent in performance (EFQUEL, 2005). In particular, quality in e-learning means providing the right content at the right time, enabling learners to acquire knowledge and skills and apply their learning to improve their performance, whether as an individual or within an organizational framework (ASTD & NGA, 2001). Stephenson (2005) proposed that quality depends on its interdisciplinary nature, and the identification of quality factors for a given environment depends on the chosen perspective. As there are two essential levels—the pedagogical and the operational—the target for return of investment must therefore be viewed as long term.

National bodies and international organizations have now developed principles, guidelines, and benchmarks to describe quality based on the international developments in the field (QAA, 1998; CHEA, 2001; USNEI, 2001; ISO-9000, the Benjamin Franklin Institute, 2001; EFQUEL, 2006). Furthermore, importance is also attached to national standards resulting from the globalization and universal access of learners as customers and taxpayers. For example, in Europe, there were efforts for regionally harmonized systems (see Bologna Declaration, European Ministers of Education, 1999) and Quality Assurance (QA) and accreditation systems developments. Brajnik (2001) proposed that a quality model seeks 'quality' by:

- understanding, controlling, and improving a product or a process;
- identifying problems or performance bottlenecks, base-lines, and timescales, and,
- comparing these for progress assessment, as well as for distinguishing certain attributes from others.

This method for developing and documenting a quality model suggests the production of a complete and consistent set of quality requirements (Firesmith, 2003). Attempts to provide such quality frameworks were conducted by European organizations but they have yet to be fully tested.

The European Foundation for Quality in E-learning (EFQUEL) was established in June 2005 in order to provide a coherent framework of quality factors for all European organizations. Its mission is "to enhance the Quality of eLearning in Europe by providing services and support for all stakeholders" (Nascimbeni, 2005, EFQUEL). This means that the quality factors are explicitly connected to the provision of services and support for all stakeholders from different fields. EFQUEL has attempted to map a quality model by incorporating stakeholders' perspective for policy makers, researchers, e-learning quality related organizations, decision-makers, e-learning users, and learners. EFQUEL conducted a European survey between 15 August 2004 and 15 November 2004 (Panorama Report, Ehlers, Hildebrandt, Görtz & Pawlowski, 2005). Of the 5,023 responses, 28 percent completed it, and only seven percent finished the two basic sections on quality of e-learning. (The low response rate may have been due to inherent difficulties of understanding and defining what e-learning quality is. It is perhaps easier to described what quality is than to define it (Stephenson, 2005).) According to the results, quality relates to obtaining the best learning achievements (50 percent) and "something that is excellent in performance" (19 percent). In detail, the Panorama Report revealed the following:

(1) **the importance of e-learning quality**: Quality is, and will be of great importance for e-learning.
(2) **the need for specific frameworks:** Although numerous quality strategies and concepts were used, the understanding of quality is lacking—this being conceived as an abstract rather than a concrete form. The respondents *believed* that they knew about quality but they showed a general lack of information on quality measures, and that deceived them.
(3) **quality requirements in design:** Learners are both users and customers, and are seldom involved in design in public and business sectors, but design for quality needs to consider the following issues:

- their recommendations for successful quality development. This will prevent the low level of acceptance of designs that lack user quality.
- the inclusion of organizations' own checklists for quality found in web resources, discussion forums and fairs;

The above shows that designers of quality must have experience of quality and ability to meet challenges; to change and adapt, to incorporate quality strategies, and being open to creativity for entirely new forms of quality development.
(4) **critical awareness:** Analysis and criticism of quality demands:

- a high degree of critical awareness;
- quality systems that reconcile the objectives of all the individuals involved;
- quality must be seen as a dynamic process of adaptation to users' needs, primarily those of learners.

The researchers produced a framework of processes for describing quality approaches. This framework refers to general conditions of e-learning that comprise analysis of the external context; design and production involving testing, adaptation, and release of learning resources; implementation, evaluation, and optimization; and lastly, establishment of requirements such as initiation, identification of stakeholders, definition of objectives, and analysis of needs. They stressed that "learners must play a key part in determining the quality of e-learning services", and insisted on the integration of all stakeholders in the process. The outcome of the European efforts was the white paper ISO/IEC 19796-1 entitled *How to Use the New Quality Framework for Learning, Education, and Training* (Pawlowski, 2006)—yet to be fully tested.

In the UK the Government's University for Industry has embraced a learner-centred approach, learning to be determined by the learner, for its ICT programmes. This is to be done by transforming traditional methods of learning (University for Industry, 2003). The Quality Assurance Agency for Higher Education (QAA, 2004) described quality assurance as a code of practice with conditions in place for students to achieve, as set by the institution (QAA, 1998). QAA evaluation is based on teams of academics conducting audits and processing learner reviews. (For detailed QA efforts and comparison see Parker, 2003.) The quality assurance seems to be a description of quality factors for a planned and systematic review of an institution or a program. This description determines the acceptable standards of learner-centred education, scholarship, pedagogic culture and expertise, infrastructure, and organizational strategy and vision, and ensures that these are being maintained and enhanced (Pond, 2002). In the business sector, quality of e-learning in organizations is associated with guidelines for finding and choosing quality in e-learning courses, services, and providers in the e-learning marketplace (WR Hambrecht + Co, 2000).

Because of its intangible dimensions, e-learning quality control creates challenges to contemporary research. Overall, e-learning quality appears to derive from interdisciplinary approaches on learner-centred frameworks and depends on the organization's' infrastructure, organizational strategy, and vision. However, working on a meta-study on e-learning, Pinelle and Cutwin (2000) reported that in real world settings only one-quarter of the articles included evaluations. Thus researchers missed the current transition from the Industrial to the Information and Collaboration Age as the Tavistock Institute had predicted in 1949 (Mumford, 1983; Dolence & Norris, 1995, cited in Parker, 2003). In fact, these changes are apparent in the ways people work, learn, and entertain themselves, which shows the need of multiple skills within an organization. Therefore, although QA processes are necessary, it is difficult to set specific QA standards in a transitional period. In this connection, a European survey on e-learning quality revealed the problem of reflecting reality, and directly associated it with e-learning instructional design (Massy, 2002).

In order to ensure quality education without empirical and systematic assessment, Pond (2002) provided a set of universal attributes (criteria). He referred to the most widely used definitions of quality, quality assurance, and accreditation, with the learner at the centre of the evaluation process. According to Pond, accreditation is the process used in education to ensure that schools, post-secondary institutions, and other education providers meet and maintain the minimum standards of quality and integrity. This would include academics, administration, and related services (USNEI, 2001). He called on the Council for Higher Education Accreditation to define quality. In its glossary for International Quality Review, quality is defined as "fitness of purpose—meeting or conforming to generally accepted standards … [Quality assurance is] … planned and systematic review … of an institution or program to determine that acceptable standards of education, scholarship, and infrastructure are being maintained and enhanced" (CHEA, 2001). That is to say, learners' expectations have to be met or exceeded. In other words, they must acquire knowledge and skills that they did not possess before the learning experience took place. Wallace (1999) and Smulders (2002) saw the learner in e-learning as both a learner and a user, and then quality standards need to be defined in practical terms on both pedagogical and operational levels.

QUALITY ASSURANCE (QA)

Quality assurance (QA) is a planned and systematic review process of an institution or program to determine that acceptable standards for learner-centred education, scholarship, pedagogic culture and expertise, infrastructure, and organizational strategy and vision, are being maintained and enhanced. This would include expectations that mechanisms of quality control for benchmarking are in place and effective. QA provides the means through which an institution ensures that conditions are such that students can achieve the standards set by that institution or other awarding body. Benchmarking provides signposts against which outcomes can be measured. Subject benchmark statements allow the academic community to describe the nature and characteristics of programs in a specific subject. They also represent general expectations about the standards for qualifications at a given level; they articulate the attributes and capabilities that those possessing such qualifications should be able to demonstrate. Benchmarking is therefore a prerequisite for quality assessment.

Quality assessment is a diagnostic review and evaluation of teaching, learning, and outcomes based on detailed examination of curricula, structure, and effectiveness. It is designed to determine whether or not the institution or program meets generally accepted standards of excellence, and to suggest further quality improvements.

Quality improvement refers to expectations that an institution will have to plan, monitor and improve the quality of its programs. In most cases, the quality assurance of an accrediting agency requires established procedures to ensure an ongoing process (CHEA, 2001). According to Pond (2002), the new educational online paradigms are learner-centred, tailored, open, collaborative, qualitative, and flexible. They may also be locally differentiated. These criteria meet a universal set of quality e-learning criteria. Online education should therefore provide:

- continuity between advertising and reality
- continuity between purpose and practice
- preparation for external credentialing/further study
- personal/professional/academic growth for the learner
- relevant
- rich, multidirectional interaction
- functional, user-friendly interface
- adequate resources for: instructors, learners, curriculum
- appropriate assessment methods/opportunities

Pond's criteria seem to be eminently constructive for a learner's development.

In conclusion, quality assurance, assessment, and improvement require sets of performance, benchmarks, and indicators based on evaluation tools and techniques. The latter need specific criteria anchored in quality factors. E-learning quality factors describe these systematic reviews and evaluation of principles, guidelines, and benchmarks. However, there is a problem related to labour-management issues during collective bargaining vis-à-vis quality education. It is important that to be in alignment with the international, national and organizational targets need to be in alignment. This is the major challenge.

QUALITY FACTORS

It is evident that '*quality is easier to describe and illustrate than to define*' (Stephenson, 2005:1). Ensuring e-learning design for cognitive engagement in practice associated with outcomes is exactly what constitutes e-learning (Kalantzis & Cope, 2004; Oliver, 2005). Systems design has to ensure factors for quality at different levels and fields, micro or macro (Hedberg et al., 2002). Recent studies aim to identify quality factors. These studies are guides to good practice (Grahan et al, 2002); indicators for online teaching (Corich et al., 2004); pedagogical dimensions for computer-based education evaluation (Reeves, 1997); quality management (López et al., 2003); learners' perspective (Ehlers, 2004); pillars for quality assurance and accreditation (Pond, 2002); and evaluation frameworks and tools (Muir et al., 2003). These studies referred to specific institutions' QA standards, defining all stakeholders' goals based on international, national, and organizational frameworks.

According to the International Standard Organization ISO/IEC 19796-1, QA can be ensured by:

- identifying the main quality objective for a process;
- identifying the responsible actors;
- identifying methods or instruments that can be used to assure quality; and
- designing to measure the success of the quality objective.

For example, if an organization provides short-term programming courses for groups of 20 students learning C++ in two weeks, the online teaching and learning style is quite different than it would be if the objective were to learn Greek. The system needs to meet the learner's objectives. Another example is proposed by Parker, as four QA principles (2003):

- guaranteeing consistency in the product's results based on long-term values;
- guaranteeing consistency in governmental and corporate education;
- guaranteeing learner-centred education;
- guaranteeing collaboration between internal and external stakeholders).

Parker believes that in order to maintain continuity and consistency it is important to define values. As mentioned earlier, collaboration between the stakeholders for a learner-centred education is the key to success. Institutions need to have a proper understanding of their monitoring operations if they are to improve decision-making and performance. This being done, they will satisfy both themselves and external agencies that they are effective in achieving aims and objectives, as well as being cost-effective and cost-efficient (Rumble, 1986).

To sum up, specific frameworks are necessary to specify quality factors and requirements fit for purpose. Collaboration between all stakeholders is critical: involvement of all stakeholders in the process of design is important: good evaluation tools and techniques ensure quality. E-learning is valuable as an added learning environment to enhance human capabilities further.

Design to enable human capabilities

For the past 50 years, two main trends have been observed in general education: (a) the socio-cultural focus; and (b) the integration of technology in educational practice. However, still in its infancy, e-learning has yet to construct models of design to reach socio-cultural learning targets. There is as yet to employ consideration of the learner and user (Wallace, 1999; Smulders, 2002). Poor interfaces do not support e-learners efficiently and effectively, even though the existing commercial and open source **learning management systems** (LMS) provide several applications and tools. Most learning management systems are based on a constructivist model, and not on an e-learning community and reflective model of supporting distance education (Rumble, 2001). There are, therefore, no multiple perspectives of e-learning's theoretical framework. Evaluators are still not supported by coherent, interdisciplinary evaluation frameworks and tools. This results in inadequate understanding and lack of descriptions of quality factors. To Silius and Tervakari (2003), one evaluator, whether s/he is a teacher or a systems' designer or a quality planner, can hardly be an expert in all aspects. Collaboration between the stakeholders is the first step towards the adoption of a more social model for e-learning.

THE SOCIAL DIMENSION OF LEARNING IN DESIGN

Computer-supported collaborative learning (CSCL): The social aspects of learning with the aid of computer networks first appeared in CSCL. This followed the computer-supported collaborative work (CSCW) that utilised **ethnography** (Garfinkel, 1967) in systems design. Ethnography provides descriptions of qualitative and quantitative data about human social phenomena based on fieldwork, and was used to search for descriptions that could provide abstract specifications for systems design, i.e., finding ways to communicate to the designers what users want. Thus, the research of Hughes and colleagues was based on **socio-technical design** (STD) (Mumford, 1983; Fan, 2006) to inform the designers of system requirements. The STD mission was to assist system designers to maximize human gains while achieving business and technical excellence (Mumford, 1983). It recognises the interaction of technology and people, and produces work systems that are both technically efficient and have social characteristics. CSCL is linked to STD via CSCW (Hughes et al., 1997) and is anchored in the notion that, the system cannot be accurately understood as each property depends on the other.

Computer-supported collaborative learning (CSCL) was based on theories that emphasized the social dimension of learning, such as distributed cognition (Hutchins, 1995; Salomon, 1993); activity theory (Engestrom, 1987; Kuutti, 1996); situated learning (Resnick, Levine & Teasley, 1991); Greeno, Smith & Moore, 1993); collaborative learning (Crook, 1994); and legitimate peripheral participation in communities of practice (Lave & Wenger, 1991; Wenger, 1998; Wenger et al., 2002). Collaborative computer-supported collaborative learning has contributed significantly to the socio-cultural field.

Network-supported collaborative learning (NSCL): NSCL has emerged as a similar educational paradigm. It includes cognitive sciences, sociology, and computer engineering. See Banks, Goodyear, Hodgson & McConnell, 2004; Steeples and Jones, 2002. This interdisciplinary approach has also introduced the role of learning technologist (Conole & Oliver, 2002; Conole, 2004). However, owing to inherent difficulties in performing evaluation in general, as well as evaluation in its own field, very few systematic and complete studies have been reported in NSCL literature (Retalis et al., 2006).

Research in computer-supported collaborative learning and network-supported collaborative learning have found common ground between disciplines, and is now focused on learners working collaboratively. There is still the need, however, for the teacher and the technologist to acknowledge the individual e-learner's requirements. In fact, the learner behaves as a learner, a user, and a customer. Even though learning technologists have aimed to fill this gap, the result is still technocentric design and poor usability (Diaz, 2002; Notess, 2001). The problem remains. There is need for learning management systems to provide an integrated platform for collaborative learning in communities of practice (CoP, Lave & Wenger, 1991). Delivery of the learning product, supporting management, engagement, and tracking of information and activities should facilitate e-learning communities. The Web 2.0 philosophy and tools are currently in favour of such initiatives, but the systems are still in the first stage of development supporting information provision that community knowledge building.

Socio-technical design requires social software qualities of sympathy, trust, and integrity (Mumford, 1983). In e-learning this has been referred to as **affective learning** (AL). Affective learning properties link the individual with the community. Such properties include the emotions, intentions, attitudes, interests, attention, awareness, trust, motivation. or empathy enable communication, consultation, and participation (Zaharias, 2004). For example, Grosz and Sidner (1986) suggest that the discourse structure is intimately connected to intention; for instance intentional information in discourse structure creates adaptation of a conversational channel (Woodruff & Aoki, 2004). Empathy is another example, which is considered essential for participation in online communities (Preece, 1999; Preece & Ghozati, 2000; Lambropoulos, 2005).

Affective learning in design: A learner-centred approach to e-learning quality relies not only on cognitive but also on emotional and affective learners' engagement (Zaharias, 2004). Such a learner-centred approach acknowledges the importance of context, and views learning as a social and collaborative process. In the learner-centred paradigm, learners are the focal point—the centre of the learning process. They should take responsibility for their own learning, reflect, and make sense of their experiences. Interconnections between the dual persona of the learner as a user, as well as the inclusion of affective learning factors are the links between the individual and the learning community in the e-learning world. The development of brain research (LeDoux, 1998) and cognitive neuroscience allowed Rizzolati and Arbib (1998) to discover the areas where the mirror neurons are located, interacting in both hemispheres (Broca are 44 and PE/PC). Such neurons are responsible for representing the existence of other people in the brain. This discovery resulted in the scientific identification of empathy, widespread in online communities (Preece & Ghozati, 2000).

According to Zaharias (2004), such affective networks justify the *why* in learning as humans pursue goals, develop preferences, build confidence, persist in the face of difficulty, establish priorities, and care about learning. And yet, affective networks are not considered important in educational technology. It is generally difficult to engineer empathy, but with the advantage the affective learning factors provide, learning theories for the individual can co-exist with socio-cultural learning. The learning activity is the outcome, as Zaharias stressed. Learner-centred frameworks and principles should require learners to be active participants in every quality assessment process. In order to achieve this, Zaharias provided a set of quality principles and their implications for e-learning instructional design quality. His seven quality principles associated with specific implications for e-learning design quality are:

- individual differences relevant to learning styles and preferences
- information overload
- contextual learning
- social learning
- active learning
- reflective learning
- emotional engagement focusing on motivation.

Zaharias' quality principles echo the need for a systems' design model that can support the formation of e-learning communities for the benefit of the individual and the community. Currently, there is still need of support of collaborative activities and active participation integrated applications. The first generation of learning management systems (LMS) was focused on information provision and management rather than learning. The new generation of LMSs following Web 2.0 philosophy needs to support the learners in their collaborative activities.

ENABLING HUMAN CAPABILITIES: DESIGN FOR LEARNERS AS USERS AND USERS AS LEARNERS

Design for learners-users-customers refers to Shackel's definition of user-centred design (1991). He suggested that designers need to enable human capabilities. To achieve this, the individual needs to meet the purpose of systems design without any additional cognitive and physical struggle to use it. The International Organization for Standardization (ISO) defined **usability** as a measure of quality of user experience when interacting with a system, in terms of effectiveness, efficiency, and satisfaction (ISO FDIS 9241-11, 1997). Faulkner (2000) suggested that users who do not have to learn to use the system, as the system is already easily used, are freed from the restrictions of their own ability to learn. Initial adaptation of the right attitude is of primary importance (Faulkner, 2000, p. 78). This implies that ensuring usability enables the ability to learn.

Instructional design (ID) is a process of resolving instructional problems through systematic analysis of learning conditions. ID starts with the initialization and project planning phase (how the instructional design is carried out); the design and development phase (appropriate strategies and approaches in targeted contexts); a QA phase is focused on evaluation and deployment. The general observation of Bichelmeyer and colleagues (2004) is that the process for most instructional designers is the same: **a**nalyze, **d**esign, **d**evelop, **i**mplement, and **e**valuate (ADDIE). However, Schwier and colleagues (2006) complain that systematic models of ID do not reflect actual practice, are cumbersome, ineffective, inefficient, and costly to implement. This is due to several reasons including unfamiliarity of stakeholders with ID, division between 'academic' and 'corporate' approaches, and unawareness for the need of quality standards. He has reason. Whereas **learner-centred design** (LCD) is focused on making users more effective e-learners, **user-centred design** (UCD) is focused on making e-learners effective users in order to free them from cognitive and physical constraints, making the system easy to use. These two activities as Wallace (1999) claimed should be networked on shared social interfaces for users-as-learners and learners-as-users. This is e-learner-centred design.

To date, the focus has been on the technological (techno-centric interfaces) and not on the social aspects of learning. Thus, there are still issues for useful and usable design in support of e-learning (CHI SIG, 2001). Researchers are still seeking a design to solve such quality problems (Muir et al., 2003; Silius et al., 2003b; Zaharias, 2005). A socio-technical approach for a learner-centred design (LCD) was adopted in turn by Soloway et al., 1994; by Norman & Spohrer, 1996 and Wallace et al., 1998. Their work aimed to bridge the gap between learners as users. At the time, Norman and Spohrer suggested that LCD has three dimensions:

- engagement
- effectiveness by measuring the quality
- viability of interventions.

In support of the third dimension, they observed that projects "won't scale to real curriculum needs or large numbers of students, or diverse content areas, or to everyday teachers and students rather than handpicked ones". They also emphasized the importance of active participation, evaluation, and implementation of design interventions in real-life settings.

Their example of a combined LCD framework has been developed by later researchers along different lines. Whereas Muir and colleagues (2003) worked on pedagogical usability for online courses for learning language, Daniel and colleagues (2005) worked on a variety of user-centred evaluation approaches to consider methods for determining whether a learning community exists, attempting to isolate and understand interactions among its constituent elements. Zaharias (2004) on the other hand developed a questionnaire-based usability evaluation technique that relies upon web usability and instructional design parameters, associating them with a motivation to learn. The latter is proposed as a new affective-oriented measure for e-learning usability.

It appears that combined frameworks are necessary to go out of the control room and controlled experimentation and adjust the interventions to stakeholders' needs. In addition, measurement and evaluation is not towards control but to support successful designs and eliminate existing problems.

Every learning context is unique. Parker (2003) believes that there is an ideological congruence with the reduction of "citizens" to "taxpayers", and as the focus moves to "value-added" activities, the terrain of the debate is being narrowed to shorter and shorter transactional terms. Their focus on institutional policy and teaching with learning styles based on all stakeholders' targets is not a disadvantage and, in this chapter, it is worth considering a focus depending on active participation in collaborative learning. Understanding the controlling processes and improving them by evaluation and assessment will eliminate existing problems.

Quality assurance by design

INVOLVING ALL STAKEHOLDERS IN THE PROCESS OF DESIGN

Pedagogical heuristics: When designing systems for e-learning, we must first determine the goal, the intention, and specifications by collecting the relevant information. As a result, learners will be free to justify why they use the applications and their reasons will need to match the organization's intentions. On an operational level, we can use several evaluation frameworks, known as pedagogical heuristics. Heuristics provide a map to work with, without extensive users' evaluations. Norman (1998), Shneiderman (2002, 2005, 2006), and Nielsen (cited on his website, not dated) tried to help designers and evaluators design systems for the users by providing general guidelines. Norman proposed "seven principles for transforming difficult tasks into simple ones":

(1) Use both knowledge in the world and knowledge in the head.
(2) Simplify the structure of tasks.
(3) Make things visible: bridge the gulfs of execution and evaluation.
(4) Get mappings right.
(5) Exploit the power of constraints, both natural and artificial.
(6) Design for error.
(7) When all else fails, standardize.

A second set of heuristics comes from Shneiderman's Eight Golden Rules:

(1) Strive for consistency.
(2) Enable frequent users to use shortcuts.
(3) Offer informative feedback.
(4) Design dialogues to yield closure.
(5) Offer simple error handling.
(6) Permit easy reversal of actions.
(7) Support internal locus of control.
(8) Reduce short-term memory load.

Both sets of rules can be used as evaluation tools and as **usability heuristics**.

Nielsen (n.d.) proposed other usability heuristics for user interface design. His are more widely used:

- visibility of system status
- match between system and the real world
- user control and freedom
- consistency and standards
- error prevention
- recognition rather than recall
- flexibility and efficiency of use
- aesthetic and minimalist design
- help users recognize, diagnose, and recover from errors
- help and documentation.

His heuristics mostly refer to information provision interfaces and do not explicitly support learning in communities using social software platforms. New heuristics to support the social nature of the systems are needed after the migration of the socio-technical environments on the Internet. For example, whereas Suleiman (1998) suggested a check of user control, user communication, and technological boundary for computer-mediated communication, Preece (2000) proposed usability for online communities supports navigation, access, information design, and dialogue support.

Pedagogical usability (PU): When e-learning started to be widely used in mid 1990s, new heuristics with a social and pedagogical orientation were needed. With a social perspective in mind, Squires and Preece (1999) provided the first set of heuristics for learning with software Similarly, Hale and French (1999) recommended a set of e-learning design principles for reducing conflict, frustration, and repetition of concepts. They referred to the e-learning technique, positive reinforcement, student participation, organization of knowledge, learning with understanding, cognitive feedback, individual differences, and motivation. To date, learning design is concentrated on information provision and activities management aimed at the individual instead of e-learning communities. Thus there exists an absence of common ground between collaborative learning theories and instructional design. Lambropoulos (2006) therefore proposes seven principles for designing, developing, evaluating, and maintaining e-learning communities. These are: intention, information, interactivity, real-time evaluation, visibility, control, and support. In this way, she stresses the need to bring e-learning and human-computer interaction (HCI) together.

From an HCI viewpoint, new heuristics are needed, and there is room for research. Silius and colleagues (2003) proposed that pedagogical usability (PU) should question whether the tools, contents, interfaces, and tasks provided within the e-learning environments supported e-learners. They constructed evaluation tools using questionnaires. They involved all stakeholders in the process and provided easy ways for e-learning evaluation. Muir and colleagues (2003) also worked on the PU pyramid for e-learning, concentrating on the educational effectiveness and practical efficiency of a course-related website. They stressed that the involvement of all stakeholders in design and evaluation for decision-making was necessary.

One of the great challenges of the 21st century is quality assurance. What quality factors can be measured for effective, efficient, and enjoyable e-learning? It is suggested that this kind of evaluation be part of pedagogical usability. There have been studies investigating issues of e-learning quality: management and design (Pond, 2002); quality that improves design (Johnson et al., 2000); and quality measurement and evaluation, the last recommended by McGorry (2003) in seven constructs to measure and evaluate e-learning programs. These are:

- flexibility
- responsiveness
- student support
- student learning
- student participation in learning
- ease of technology use and technology support
- student satisfaction.

McGorry's evaluation is learner-centred, both system and e-tutors need to support learners with the ultimate goal of learner satisfaction. Absence of empirical research in the field of the everyday e-learner indicates that methods and tools for interdisciplinary measurements have yet to be considered for the individual. Because existing e-learning evaluation in general is based on past events there remain inherent problems related to understanding e-learning with the use of evaluation for feedback, and decision-making. These problems can be addressed with the integration of instructional design phases under real-time evaluation.

INTEGRATION OF INSTRUCTIONAL DESIGN PHASES: E-LEARNING ENGINEERING

The evolution of the socio-cultural shift in education created a turn in the design of instructional systems and learning management systems. Fenrich (2005) identified practical guidelines for an instructional design process targeted at multimedia solutions. He provided an overall approach involving all the stakeholders in the process of design by covering all their needs. He also employed a project-based approach by dividing the analysis phase into sub-stages, which were: the description of the initial idea, analysis, and planning. By the systematic iteration of activities and evaluation of the first stages in design, Fenrich ensured quality.

But however well-designed e-learning environments are, they cannot facilitate independent learning without interaction with others (Oliver, 2005). Current learning management systems do not facilitate social and collaborative interactions; they only provide the space for it. Collaborative e-learning can be better supported if there is more information on these interactions. These design problems are related to the collaborative nature of the task, the methods used to inform practice, design competencies, and the actual design process itself. Bannon (1994) suggested that, when designing computer-supported cooperative work, design and use of the system as well as evaluation need to be integrated. It is true that analysis, design, evaluation, and use of systems in e-learning are sustained by the interaction of pedagogy and technology. If this instructional design process is underpinned by real-time evaluation, all design phases can be informed fully and accurately. So, there is still room for feedback of instructional design phases. If this is done and instructional design accepts the integration of all the phases supported by real-time evaluation then this is called **instructional engineering** (Figure 9.2):

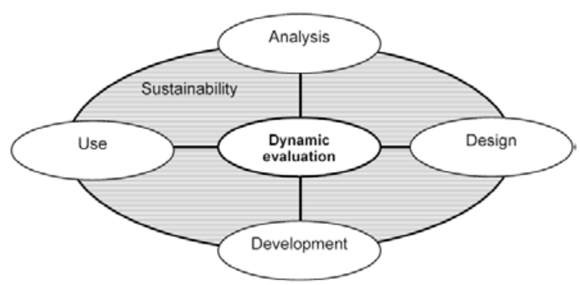


Figure 9.2 The instructional engineering cycle

Instructional engineering (IE) is the process for planning, analysis, design, and delivery of e-learning systems. Paquette (2002, 2003) adopted the interdisciplinary pillars of human-computer interaction This considers the benefits of different stakeholders (actors) by integrating the instructional design concepts and processes, as well as principles, from software engineering and cognitive engineering. Looking at the propositions of Fenrich and Paquette, we suggest there could be two ways to ensure all stakeholders' benefits. There are identification of **key variances** and **dynamic evaluation**.

Identification of key variances: All organizations need to function well without problems. The weakest links should be identified, eliminated, or at least controlled. Working on socio-technical design, Mumford (1983) believed that design needs to identify problems that are endemic to the objectives and tasks of organizations. Intentional variances stem from the organizational purposes and targets. Operational variances predate design, and are the areas the organization has to target. They stem from the operational inadequacies of the old system, and the technical and procedural problems have been built into it inadvertently. "Key variances refer to the same variance in both intentional and operational levels".

Design and engineering are connected to both intentional (pedagogical) and operational (engineering) approaches. Sometimes there are problems, called variances in socio-technical design. From an educational perspective, Schwier and his colleagues (2006) emphasized the need of intentional (principles or values) and operational approaches (practical implications), and provided an analytical framework of the gaps and discrepancies that instructional designers need to deal with. The identification of a key variance helps the organization to provide added-value outcomes. This is achieved by the use of dynamic evaluation.

Dynamic evaluation: According to Lambropoulos (2006), e-learning evaluation aims to control and provide feedback for decision-making and improvement. It has four characteristics: real-time measurements, formative and summative evaluation, and interdisciplinary research. Dynamic evaluation links and informs design. It also provides immediate evaluation to user interface designers. In addition, it identifies signposts for benchmarking, which makes comparisons between past and present quality indicators feasible (Oliver, 2005). Such dynamic evaluations will enable the evolution of design methods and conceptual developments. The use of several combined methodologies are necessary in online environments. Andrews and colleagues (2003), De Souza and Preece (2004), and Laghos and Zaphiris (2005) are advocates of multilevel research in online, and e-learning environments. Widrick, cited by Parker, claimed that: "[it] … has long been understood in organizations that when you want to improve something, you first must measure it" (2002 p. 130). Parker (2003 p. 388), does not see that engineering for unified learning environments is feasible:

> "The engineering (or re-engineering) of systems designed to guarantee that manufacturing processes would meet technical specification might seem to imply a uniformity that may not be possible, or even desirable, in the dynamic and heterogeneous environment of higher education."

According to Parker, a unified systems design is not possible, or even desirable. The interdisciplinary nature of e-learning, the large number of stakeholders involved, and the uniqueness of the context make e-learning engineering extremely difficult. Nichol and Watson (2003, p. 2) have made a similar observation: "Rarely in the history of education has so much been spent by so many for so long, with so little to show for the blood, sweat and tears expended".[14] It is contended that e-learning engineering, including dynamic evaluation, may well minimize the cost. User interface designers should recognise the need to limit this process to a period of days or even hours, and still obtain the relevant data needed to influence a re-design (Shneiderman & Plaisant, 2005).

At present, the design process is still vulnerable to the **Hawthorn effect** (Faulkner, 2000). Laboratory research ignores the distractions of e-learner behaviour in the real world. On the other hand, dynamic evaluation enables the evolution of design methods and conceptual developments (Silius & Tervakari, 2003; Rogers, 2004). Ethnography captures events as they occur in real life, and then uses them for design. It can be a time-based methodology aiming for a description of a process in order to understand the situation and its context, and to provide descriptions of individuals and their tasks (Anderson, 1996). This type of research could be said to be part of dynamic evaluation in e-learning engineering (Figure 9.3):

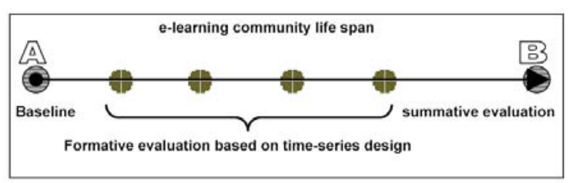


Figure 9.3 Formative and summative evaluation in e-learning communities

The line from A to B in Figure 9.3 represents the lifespan of an e-learning community. A short or long term e-learning community may have a beginning (A) that is the baseline, and an end (B). Usually, the comparison of

[14] Editorial "Rhetoric and Reality—The Present and Future of ICT in Education" for the *British Journal of Educational Technology,* by Nichol and Watson (2003:2).

data collected in A and B provides the summative evaluation. The success or failure of the e-learning community is apparent where the initial organization's targets are met. Most times there are differences between what the different stakeholders want or seem to need. (See Cohen's PhD thesis, Appendix I, 2000.) Formative evaluation can shed light on the individual stages of e-learning and in understanding key variances as they occur. This provides feedback and control for all stakeholders.

To date, most evaluation and research is designed to support summative evaluation. The existing tools and evaluation methods are not designed to aid dynamic evaluation. If new tools can be designed for e-learning engineering, then, quality assurance, assessment, and improvement will control arising problems, and enhance best practices. Current efforts to meet these targets for quality are connected to the dissolution of traditional educational hierarchies and other systems (Pond, 2002).

Summary

The intention of this chapter on quality assurance by design is to raise awareness of the importance of quality, and attempts to propose frameworks in order to ensure quality by design. E-learning quality derives from interdisciplinary approaches on learner-centred and social frameworks, and depends on organizations' infrastructure, strategy, and vision. Web 2.0 signifies the current transition from the Industrial to the Information and Collaboration Age. Changes in the new ways that people work, learn, and entertain themselves are being established. It is therefore necessary to agree on specific quality standards in this transitional period. In general, quality refers to a fitness of purpose and excellence in performance defined on pedagogical and operational levels. In e-learning quality assurance is a planned and systematic review process to determine that equally acceptable standards are being maintained and enhanced. A summary of this chapter would include the following:

- awareness of the importance of quality in e-learning
- inclusion of all stakeholders in e-learning engineering
- support for e-learning communities
- dynamic evaluation

In this time of change, participation of all stakeholders in quality assurance processes will help the e-learning evolution in the 21st century.

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Glossary

Affective learning. The "why" in learning. Plays a part in the development of persistence and deep interest in a subject by incorporating affective elements in the learning goals.

Computer-supported collaborative learning (CSCL). CSCL focuses on how collaborative learning supported by technology can enhance peer interaction and work in groups, and how collaboration and technology facilitate sharing and distributing of knowledge and expertise among community members.

Dynamic evaluation. Real-time evaluation in e-learning environments that covers interdisciplinary assessment for decision-making, control, and improvement.

Ethnography. From the Greek *ἔθνος ethnos* = people and *γράφειν graphein* = writing. Refers to the sociological approach that aims to describe varying degrees of qualitative and quantitative descriptions of human social phenomena, based on fieldwork. Ethnography presents the results of a holistic research method founded on the idea that a system's properties cannot necessarily be accurately understood independently of each other.

Hawthorn effect. Asserts as fact the idea that the mere act of observing/studying something can alter it, and also asserts that this effect explains some of research results.

Human-computer interaction (HCI). Concerned with the design, evaluation and implementation of interactive computing systems for human use, and with the study of major phenomena surrounding them.

Instructional design (ID). A process of resolving instructional problems through systematic analysis of learning conditions. This process is often referred as ADDIE to describe the ID phases of analysis, design, development, implementation and evaluation.

Instructional engineering (IE). An instructional design process with integrated phases via dynamic, real-time evaluation and focus on one pedagogical approach as the added value.

Learner-centred design (LCD). An instructional design process where learning is determined by the learner.

Learning management systems (LMS). Synchronous and asynchronous learning environments that incorporate tools for teaching and learning management.

Network-supported collaborative learning. Emphasizes the role of social interactions in the construction of knowledge.

Pedagogical heuristics. Guidelines used as checklists to ensure that usability serves the purposes of learning.

Pedagogical usability (PU). Denotes whether the tools, content, interface, and tasks support learning without any physical and cognitive effort to use the system, which is easy-to-use.

Quality assurance (QA). A planned and systematic review process of an institution or program to determine that acceptable standards for learner-centred education, scholarship, pedagogic culture, and expertise, infrastructure, organizational strategy, and vision are being maintained and enhanced. Usually includes expectations that mechanisms of quality control for benchmarking are in place and effective.

Quality assessment. A diagnostic review and evaluation of teaching, learning, and outcomes based on a detailed examination of curricula, structure, and effectiveness of the institution or program. It is designed to determine if the institution or program meets generally accepted standards of excellence and suggestions for further quality improvements.

Quality improvement. The expectation that an institution will have a plan to monitor and improve the quality of its programs.

Socio-technical design (STD). A process for systems design that supports the social system which is built for, and assists, designers to maximize human gains while achieving business and technical excellence.

Usability. A measure of quality of user's experience when interacting with a system, in terms of effectiveness, efficiency, and satisfaction.

Usability heuristics. Checklists used as rules of thumb to ensure that systems are easy to use by the users.

User-centred design (UCD). An iterative process whose goal is the development of a usable system achieved through involvement of potential users of a system in system design.

Value-added. The additional value created at a particular stage of production, referring to the contribution of selected factors in order to raise the value of a product.

Appendix

Comparison of the roles of ICT in education (Cohen, 2000; adapted and cited in Nichol & Watson, 2003, p. 4)

Theme	Policy Makers	Teachers	Pupils
(1) Idealism	Leap of faith required—policy must be based on 'a common-sense act of faith' (Stevenson Report)	Idealism is treated with suspicion and skepticism, both as to motives and practical effects	Enthusiastic with some practical reservations
(2) Economic competitiveness	Vital role, but undefined 'Technology has revolutionised the way that we work' (DIEE Connecting *the Learning Society*)	Economic role seen as peripheral, some low-level skills for low-level jobs	Strong sense of usefulness for future employment prospects, undefined as to how ICT can help, i.e., no link between use of ICT in schools and the world of work
(3) Individualised learning	Will produce autonomous learners, linked to their needs and abilities	Concern over too much non-directed learning, with opportunity for pupils to be off task. However, increase in attention and motivation from ICT identified	Mixed response, benefits of autonomy recognized, while recognizing that teacher help and support is essential
(4) Enjoyment	ICT makes learning more attractive	Recognition of pupil enjoyment of using computers, but concern over computers as a distraction from normal school work, i.e., computers as games playing machines	Mixed—it is the use that is made of the computer that matters. In some instances it enhances enjoyment; in others it has a negative impact.

Theme	Policy Makers	Teachers	Pupils
(5) ICT for the production of work	Only marginal importance, one of a cluster of skills. Emphasis on versatility (DIEE, *Superhighways*)	Central role, particularly in producing good quality work	Accepted as a tool for research and editing of work. High value attached to improvements in neatness, spelling and presentation
(6) Social relations	Important cross-cultural and egalitarian role. Facilitates communication and interaction between people	Doubtful as to social effects, as computers may encourage both laziness and anti-social behaviour. But recognise the growing communication role of ICT	Mixed. Accept communication role of ICT but also concerned over anti-social effects, i.e., addiction and laziness
(7) New educational methods	Major change in classroom culture vis-à-vis the role of both teacher and pupil. Teachers as classroom managers, with pupils as independent e-learners	Add to existing teaching methods. Other, radical aims concerned unrealistic in currect school context	No perceptions of any changes. Assumed to be an aid to existing methods, and complementing what is already being taught
(8) Scepticism	No room for scepticism	Highly sceptical as to reasons behind ICT policy. Innoveation without any clear indication fo change that brings about improvement. Suspicious of the reasons behind having computers in schools, as the National Curriculum defines what is to be taught	Mixed reaction. Positive as to benefits of ICT in terms of point 5—the production of work. Recognise that ICT can have benefits. Overall regard it as one of many phenomena that they encounter on a day-to-day basis

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10
General Principles of Instructional Design

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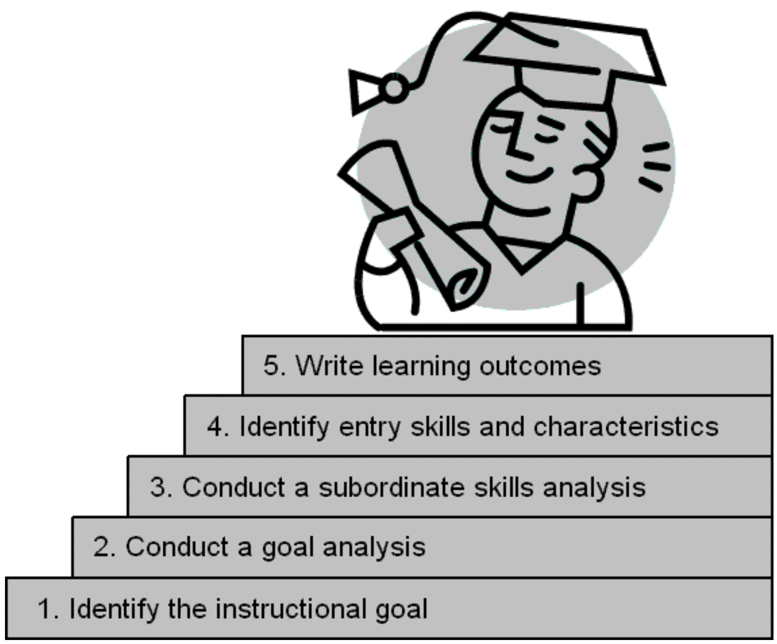
If you're not sure where you're going, you're liable to end up some place else.
– Robert Mager



Learning outcomes

After completing this chapter, you should be able to:

- Describe each step of the instructional design process.
- Assess needs.
- Analyze goals.
- Identify subordinate skills.
- Conduct a learner analysis.
- Write complete learning outcomes at the highest appropriate level.
- Create courseware using the instructional design process.

Introduction

Instructional design is a systematic, repetitive process of activities aimed at creating a solution for an instructional problem.

In this chapter we describe the instructional design process, and provide details and practical guidelines for completing the process. You will also learn how to conduct a needs assessment and a learner analysis. This chapter also introduces a revised **Bloom's taxonomy** (Anderson & Krathwohl, 2001).

The steps in the instructional design process are shown in Figure 10.1. These steps, which are similar to other models, are adapted from Dick and Carey's (1990) model. Note that this chapter only covers the steps through to "Write learning outcomes". The subsequent steps, shown in Figure 10.1, are covered in other chapters of this book.

One danger in the instructional design process is that it can go on forever. Each step is a checkpoint, and must be signed off with the general knowledge that the results are acceptable enough to continue in the project. However, subsequent evaluation **feedback** may indicate a need to make changes in previously signed-off steps. These changes are sometimes the result of not putting the necessary time and resources into each step the first time.

This model represents an ideal situation. However, cost and time constraints will sometimes force you to make modifications. How safe such modifications as omitting or minimizing steps are will depend on the actual problem being solved, the information that is available, and your intuition or experience.

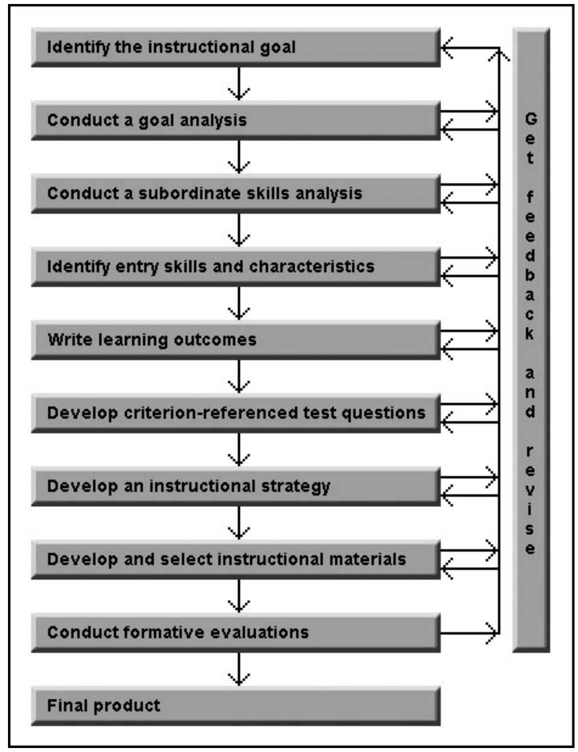


Figure 10.1 Steps in the instructional design process

For some courses, the systematic instructional design process can take hundreds of hours of development time. Factors such as the course's complexity, the course management system used, the availability of resources such as instructor notes, the team members' experience, team dynamics, and whether suitable design specifications exist, can all affect how much time is required.

Identify the instructional goal(s)

Instructional goals are general **learning outcomes** that break down into specific measurable skills, for instance, learning to speak conversational French. Before identifying the instructional goal, you must first define the actual problem. You can gather the information for defining the problem and identifying the instructional goal through a **needs assessment**.

A needs assessment is a method for determining the actual problem, rather than the symptoms of a problem. For example, an individual may refuse to use the computer system because the "program doesn't work". In this case, the symptom (refusing to use the computer) may be hiding the real problem, which might be a fear of the technology, or of change.

A needs assessment is a valuable tool for:

- gathering information;
- understanding potential users;
- consulting users; and
- ensuring involvement, ownership, and fewer surprises for all affected individuals.

Tip

Be sure that you define the real problem rather than a symptom of the problem.

NEEDS ASSESSMENT TOOLS AND TECHNIQUES

Needs assessment tools and techniques include interviews, observations, surveys, group meetings, and a review of any existing documentation. You will need to decide on the best way to get accurate information, given limitations such as time and money. While conducting the needs assessment, avoid letting preconceived ideas, one particular idea, or too many ideas overly influence the problem definition or any step in the instructional design process.

Interviews

During interviews, consider asking people to:

- share problems they have experienced;
- rank a list of skills that can make them more effective;
- describe feelings or impressions pertaining to certain skills; and
- identify the best solution to a problem.

Phone interviews can be convenient, though person-to-person interviews are often preferred because body language can provide critical information. It takes skill to determine the truth, as Robert Orben noted: “Smart is when you believe half of what you hear. Brilliant is when you know which half.”

Observations

When making observations, ask people to demonstrate particular tasks. A task analysis, or complete step-by-step breakdown of the duties needed to perform a task, can provide important information about what actually happens. Watch for problems caused by inefficiencies. Determine the difference between actual and optimal performances. Be careful of the **halo effect** in which people behave differently because they are being observed. Determine what you can do when people do not want to be observed. Another observation technique is to analyze work products. Defects can show where problems occur in the process.

Note that existing reports, records, and statistics often contain relevant information.

Surveys

Surveys can be more effective if the survey is based on earlier observations, which might provide useful information about what questions to ask. In the survey, try to determine feelings. Attitudes can play a major role in job performance. Consider whether the provided information will be accurate. Will everyone fill out the survey honestly? Provide incentives to encourage participants to complete the surveys.

Group meetings

Group meetings can be an economical way to gather information. Before the meeting begins, carefully plan how you expect the meeting to proceed, but be flexible enough to allow the meeting to flow in other useful directions. Note that it is important to prevent discord between group members, and to prevent one or two individuals from influencing the group unduly.

Reviewing existing documentation

Existing documentation could provide a list of existing goals or even reveal that the problem is already documented. It may state that there is a requirement for new instruction (e.g., learning how to use or repair new equipment or technology) or that there is a new mandate that requires an instructional solution. Documentation can be problematic if the goals and learning outcomes are non-existent or vague, there are contradictions between what is asked for and what is needed, or goals and learning outcomes shift.

NEEDS ASSESSMENT RESULTS

Most importantly, your needs assessment should result in a precise definition of the problem. There should be a clear distinction between “what is” and “what should be”. Be sure that the real problem has been identified, rather than a symptom of the problem.

Sometimes the problem can be linked to:

- environmental issues, or technical problems such as worn or outdated equipment;
- lack of motivation, including low morale;
- poor incentives that can range from lack of recognition to undesired consequences such as extra work, or responsibilities, or an unwanted transfer;

- communication weaknesses;
- illiteracy or lack of knowledge; or
- a combination of these problems.

Remember that a simple approach such as a job aid, perhaps a checklist, a print-based package, or a trainer hired for a short time, may be the most reasonable solution.

> **Tip**
> Remember that many problems can be solved with simple solutions.

A needs assessment can also result in a statement of:

- the difference between wants and needs;
- the range of skills and knowledge that are available, and the range needed;
- how to bridge the gap between optimal workers and the less-accomplished workers;
- individual opinions and feelings;
- any factors that can interfere with learning;
- potential solutions for problems; and
- ideas for meaningful examples, cases, problems, and questions for use in the instructional solution.

Any resulting clearly defined instructional goal(s) should be:

- cost-effective;
- reached by consensus; and
- achievable with respect to time and resources.

Conduct a goal analysis

A **goal analysis** results in a visual statement of what the learner will be able to do. Consider the goal of a learner who wants to learn how to film with a camcorder. Figure 10.2 illustrates how this general goal can be broken down into specific learner requirements.

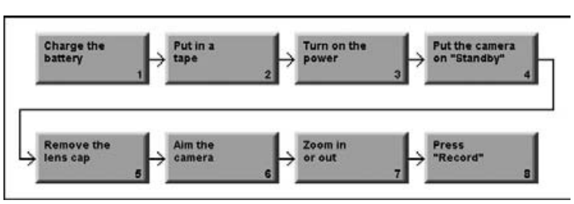


Figure 10.2 Goal analysis for operating a camcorder

To analyze a goal, describe in detail the consecutive steps the learner will complete to achieve the goal. As a rule of thumb the task should involve five to 15 steps. If there are more than 15 steps, the goal is either too big or the steps are too detailed. Some of these steps may be intangible, such as making an estimate of materials needed. Some steps may require a decision that results in two or more alternate paths. Focus on what learners need to do or perform, rather than what learners need to know.

Goal analysis includes classifying the goal into the **domain**, or kind of learning that will occur. The domains can be **verbal information** where learners state, list, describe, name, etc., **intellectual skills** such as learning how to discriminate, identify, classify, demonstrate, generate, originate, create, etc., **psychomotor skills** where learners make, draw, adjust, assemble, etc., and **attitudes** such as making choices or decisions [see Fenrich (2005) for details on these domain classifications]. Establishing the domain is important in determining what instructional strategies to use in subsequent steps.

Conduct a subordinate skills analysis

The sequential steps derived in the goal analysis are often too large to be taught in one step. The learner might need more information prior to learning a step. This can be seen in step 7 in Figure 10.2, where the learner needs some information about zooming in or out. Consequently, you need to break the steps into smaller components, using a **subordinate skills analysis**. When identifying subordinate skills, ensure the components are not too numerous, which can bore learners and interfere with learning, or too few, which can make the instruction ineffective. For each learning domain classification, you need to conduct a different type of subordinate skills analysis:

VERBAL INFORMATION

With verbal information, you should derive the subordinate skills through a **cluster analysis**. In conducting a cluster analysis, identify all of the information that is needed to achieve the goal. After you gather the information, organize the information into logical groupings. Logical groupings should have up to five pieces of information for weaker or younger learners, or up to seven pieces of information for brighter or older learners. A few people can handle nine pieces of information but it is risky to assume that all learners in the target audience can do this. Humans can only process a limited amount of information at a time. These limitations must be factored into the design. To be safe, whenever there is doubt, choose smaller groupings.

Although some people think that verbal information is trivial, it provides the knowledge base for higher-level skills.

Tip
Organize the information into small enough chunks for the learners to successfully learn.

Given the learning outcome "learners will be able to name body parts," the verbal knowledge can be organized as illustrated in Table 10.1.

Table 10.1. Organization of verbal knowledge for teaching body parts

Body area	Major parts	Smaller parts
Head	Eyes	
	Ears	
	Nose	
	Mouth	Lips, teeth, tongue
Torso	Shoulder	
	Chest	
	Abdomen	Belly button
Arm	Upper arm	
	Elbow	
	Forearm	
	Wrist	
	Hand	Palm, thumb, fingers
Leg	Thigh	
	Knee	
	Shin	
	Ankle	
	Foot	Heel, toes

INTELLECTUAL SKILLS

With respect to intellectual skills, you need to conduct a **hierarchical analysis** to determine the subordinate skills. An example of the skills needed to multiply three digit numbers is shown in Figure 10.3.

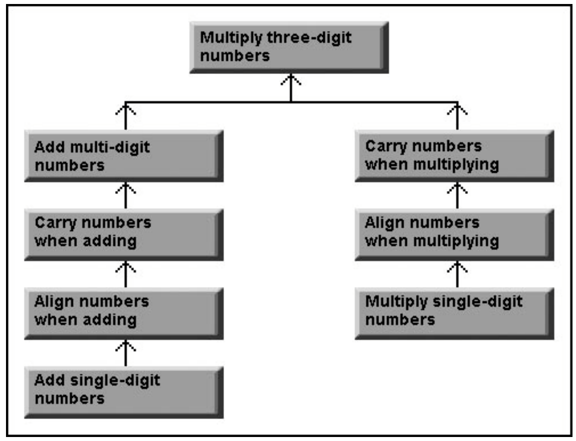


Figure 10.3 Hierarchical analysis for three-digit multiplication

For a hierarchical analysis, follow these steps:

(1) For each goal analysis ask, "What must the learner know before learning this skill?" This creates the first hierarchical level.
(2) For each first level component, ask the same question. This creates a second hierarchical level.
(3) Continue this process as needed.

Assuming a problem-solving goal, the first level might be composed of rules, the second level might be rules or concepts, the third level might be concepts or verbal information, etc. Each level can have a simpler or equally difficult skill underneath it. (See Fenrich (2005) for more information on rules and concepts.)

PSYCHOMOTOR SKILLS

You can derive subordinate psychomotor skills through a **procedural analysis**. An example of the subordinate skills needed for charging a battery for a camcorder is shown in Figure 10.4.

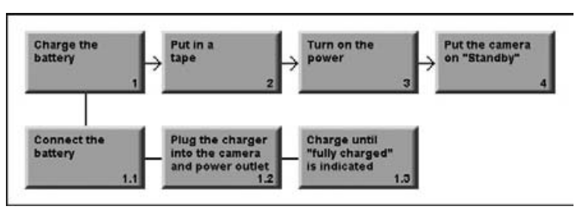


Figure 10.4 Procedural analysis for charging a camcorder battery

When conducting a procedural analysis:

(1) Specify each activity that must be done for each goal analysis step.

(2) Ask, "What must the student do or know before this step can be done?"
(3) Continue this process as needed.

The resulting chart can include several layers.

ATTITUDES

To determine the subordinate attitude skills, you usually need to conduct at least one of the preceding instructional analysis techniques:

- For each goal analysis step, ask "What must the student do when showing this attitude?" The answer is usually a cognitive, intellectual, or psychomotor skill. With this information, you can do the appropriate analysis.
- Ask, "Why should learners show this attitude?" The answer is usually verbal information. You should then do a **cluster analysis**.

Identify entry skills and characteristics

For learning to be effective and to avoid frustrating learners, you must create a match or balance between the instruction and the learners' capabilities. The instruction must be designed for the target population, defined as the widest practical range of learners. Determine, as discussed below, the learners' abilities, language level, motivation, interests, and other relevant factors. You can obtain this information by interviewing teachers and learners, testing learners, and reviewing existing documentation such as test scores. The result should determine the entry or basic skills that the target population learners have mastered before the instruction begins. In other words, these preliminary skills will not be taught. In this step, you may also discover other factors that may influence the instructional design.

Tip
Create a balance between learner capabilities and the instruction.

Based on the completed instructional skills analysis, draw a dashed line just below the skills that most, if not all, of the target population possess (Figure 10.5). You will teach the skills above the dashed line, and *not* those below the dashed line. In the example here, learners will not be taught how to add multi-digit numbers, any skill below that, or how to multiply single-digit numbers. It is assumed that target audience learners will have these skills.

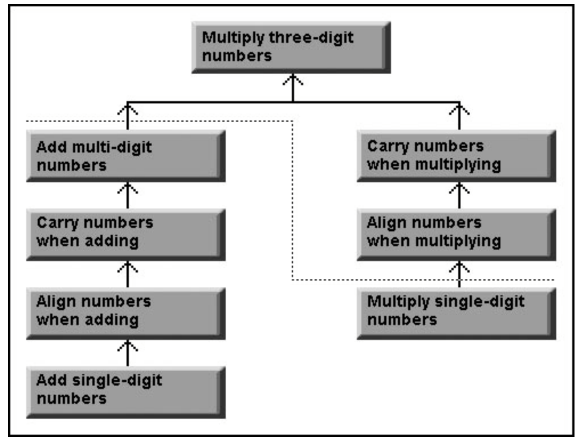


Figure 10.5 Entry skills

You should confirm this decision by asking the subject-matter experts whether the entry skills should be tested within your lesson. If there is any doubt about whether the target audience learners possess the skills, pre-test for those skills. You can do this on paper, by computer, or in any format that provides accurate data. The instructional design process later includes testing the instruction with learners who are truly representative of the target audience population to ensure that the entry-level behaviours are set appropriately.

LEARNER ANALYSIS

To adapt your instructional design to the needs of your target population, you should ask questions that elicit information about the learners' abilities, language skills, motivation, and interests. Conducting a **learner analysis** will also let you define your population precisely.

If possible, you should observe typical learners., This can help in selecting relevant and meaningful examples, choosing appropriate role models, and avoiding inappropriate stereotyping.

Tip
To ensure your materials are aimed at the correct student population, consider the learners' abilities, language capabilities, motivation, interests, and human factors.

Abilities

You should ask the following questions about the learner's abilities:

- What are the current skill levels?
  - Sometimes, a learner's prior knowledge and experience can interfere with the new learning. For example, the menu items in an old software package may be different from those used in the new version of the software. These differences can be addressed in the instructional materials.
  - Are all of the learners computer literate? To what degree? What guidance will they need?
- What are the learners' mental capabilities?
  - Are they fast or slow learners?
  - How well can they memorize information?
  - Will learners be able to choose appropriate learning paths? How will they be guided?
- What are their confidence levels?
  - This information can be used to determine the size of the incremental learning steps.
- What are the learners' maturity levels?
  - Are they independent or do you need to closely monitor their work and progress?
- Are there any learner misconceptions?
  - Ensure that you address all misconceptions.
- Will learners prefer to work alone, in pairs, or in groups?
  - Provide activities for each preference. for variety, and to ensure that learners can work in the way they prefer some of the time.

Language capabilities

You should ask the following questions about the learner's language capabilities:

- What are the learners' language levels?
- What specialized vocabulary do the learners already know?
- Is their preferred language style conversational, scholarly, or technical?
- Should the material be taught in one, two, or more languages?
- Will an audio narration be needed for learners who have weak reading skills but good oral comprehension?

Motivation and interests

You should ask the following questions about the learner's motivation and interests:

- Why should the learners learn the material?
  - What would make the material particularly relevant and meaningful?
  - Are there any attitudinal or motivational problems? If so, how can these problems be overcome?
- What are the learners' background experiences?
  - Learners can bring a vast amount of knowledge and life experiences to a learning situation.
- What will the learners find interesting?
- Are learners learning the material because they are required to learn it, or because they want to learn it?
- Are there any learner preferences for specific media?
  - Remember that learning effectiveness is a primary concern.
  - Will learners be easily de-motivated with certain media? For example, do learners presume that materials with a large text component are boring?
  - Are there past failures associated with a particular medium?
- How should testing be done?
  - Are certain test formats preferred over others? For example, would short-answer questions deter learners who have poor keyboarding skills?
  - Should testing be formal or informal?

Write learning outcomes

Learning outcomes or objectives are specific measurable skills and are more specific than instructional goals. For example, if a goal is to be able to speak conversational English, a learning outcome could be to conjugate the verb “to be”.

Learning outcomes communicate to learners, instructors, and other interested people, what the learners should be able to do, compared to their current skill level. Success occurs when learners achieve the planned outcomes. Learning outcomes help learners organize their studying, avoid becoming lost, make appropriate decisions such as whether to study a section or not, and maintain their motivation. If you inform your learners of the learning outcomes, they will, on average, attain slightly but significantly higher results. Even though some learners do not read learning outcomes, include them for those who do want and need them.

It is critical for you to define specific learning outcomes since they form the basis of the subsequent instructional development process. Accurate, well-written learning outcomes can save development time and money by helping to keep the process on track. Without specific learning outcomes, it is easy to start branching off on interesting tangents, which could make it impossible to finish a project within the constraints given. Whenever you have doubt about whether some material should be included, you can refer to the stated learning outcomes.

Many projects have failed because of poorly written or non-existent learning outcomes. Check all learning outcomes for flaws. If a learning outcome is not specific and measurable, do *not* proceed with further design and development. Even when you define the learning outcomes, there is no guarantee that you will successfully teach them. In order to ensure that learning takes place, you still need to follow the subsequent instructional design steps.

Tip
Well-written learning outcomes help keep the subsequent instructional development process on track.

STEPS TO WRITING LEARNING OUTCOMES

There are five steps to writing learning outcomes. For each step, think about why each example is good or poor.

(1) Once you have decided on a content area, use action verbs to identify specific behaviours. The verb should be an observable behaviour that produces measurable results. The verb should also be at the highest skill level that the learner would be required to perform. We'll discuss the revised Bloom's Taxonomy, which will give you details about the different skill levels, in the next section. Note that learners often need a knowledge base of lower-level skills in order to succeed at higher-level skills. Based on your previous entry skills decisions, you might have to teach the lower-level skills.
 Good: calculate, compute
 Poor: understand, know.

(2) Specify the content area after the verb.
 Good: Calculate averages and compute variances.
 Poor: Calculate statistical information and compute values needed in economics.

(3) Specify applicable conditions. Identify any tools to be used, information to be supplied, or other constraints …
 Good: Given a calculator, calculate the average of a list of numbers.
 Given a spreadsheet package, compute variances from a list of numbers.
 Poor: Given an available tool, calculate the average of a list of numbers.

(4) Specify applicable criteria. Identify any desired levels of speed, accuracy, quality, quantity …
 Good: Given a calculator, calculate averages from a list of numbers correctly 100 percent of the time.
 Given a spreadsheet package, compute variances from a list of numbers rounded to the second decimal point.
 Poor: Given a calculator, calculate averages from a list of numbers correctly most of the time.

(5) Review each learning outcome to be sure it is complete, clear, and concise. Get content experts and learners to review them, and get approval before continuing.

Perhaps the worst example of a learning outcome ever written is:

The learner will understand and appreciate the learning outcomes of the course.

REVISED BLOOM'S TAXONOMY

Bloom et al. (1956) classified learning outcomes into six taxonomies:

(1) Knowledge
(2) Comprehension
(3) Application
(4) Analysis
(5) Synthesis
(6) Evaluation

This has been an invaluable resource that has helped numerous educators design instructional materials to the appropriate skill and thinking levels needed. Relatively recently, Anderson & Krathwohl (2001) revised Bloom's taxonomy into these hierarchical categories:

(1) Remember
(2) Understand
(3) Apply
(4) Analyze
(5) Evaluate
(6) Create

Your subsequent instructional strategies, questions, other interactions, and tests should relate to the appropriate skill and thinking levels, which directly correspond to the stated learning outcomes. Remember that each of these six categories can contain verbal information, intellectual skills, and attitudes.

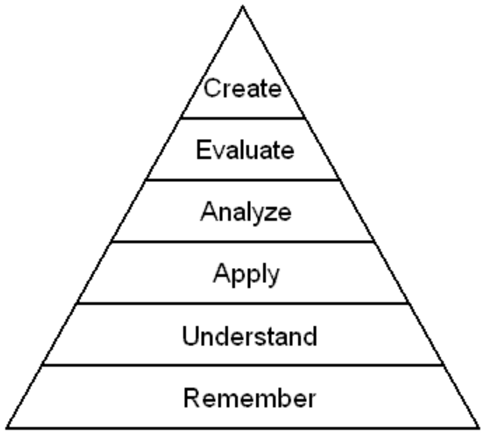


Figure 10.6 Revised Bloom's Taxonomy

Remember
Remembering skills entails recalling information as it was presented.

Sample verbs: State, describe, label, list, name
Example: List the different types of media that online courses can include.

Understand
Understanding skills can include restating knowledge learned earlier in one's own terms, translating ideas and concepts, and recognizing inferences and assumptions. Understanding skills can be tested by repeating questions and problems in a different form.

Sample verbs: Convert, estimate, explain, summarize, locate
Example: Explain why online courses should not necessarily include all types of media.

Apply
When applying skills, learners apply knowledge to new situations. Learners must decide how to solve the problem. For application skills, you can use fictional situations, material learners have not seen, or modify old problems.

Sample verbs: Relate, compute, change, apply, use
Example: Using Bloom's taxonomy, write complete learning outcomes at the appropriate level.

Analysis
Analysis breaks down existing knowledge into meaningful parts. Analysis can require learners to detect relationships and draw conclusions. You can use experiments or supply data to test analysis skills.

Sample verbs: Break down, differentiate, determine, relate, analyze
Example: Given a properly written learning outcome, identify the learning outcome's conditions, skill, and criteria.

Evaluate
Evaluation entails using personal values to judge knowledge. Evaluations are hard to grade objectively.

Sample verbs: Appraise, compare, conclude, criticize, assess, evaluate
Example: Evaluate the effectiveness of an online course.

Create
To create is to produce something new, or to modify a thing that already exists. Creating can also take the form of a speech, proposal, project, or theory.

Sample verbs: Summarize, revise, compose, construct, create, synthesize
Example: Create an online course that includes all of the instructional events.

Summary
Instructional design is the systematic process of activities that solve an instructional problem by identifying the instructional goal, conducting a goal analysis, conducting a subordinate skills analysis, identifying entry skills and characteristics, and writing learning outcomes.

An instructional goal is broad learning outcome that can be broken down into specific measurable skills. To identify the instructional goal, you must first define the actual problem through conducting a needs assessment.

Once you have determined the instructional goal, the goal is refined through a goal analysis. This will lead to a statement of what the learner will be able to do. The emphasis is on what learners need to be able to do, rather than on what learners need to know.

The goal analysis is refined into smaller components through a subordinate skills analysis. The subordinate skills analysis ensures that each component is small enough to teach, and shows what information a learner needs prior to learning each component. Verbal information, intellectual skills, psychomotor skills, and attitudes each need a different type of subordinate skills analysis.

With verbal information, conduct a cluster analysis in which you have identified all of the information needed to achieve the goal, to determine the subordinate skills. After identifying the information, organize the information into logical groupings of up to five pieces of information for weaker or younger learners or seven pieces of information for brighter or older learners. Verbal information is important in that it can form the needed knowledge base for higher-level skills.

For intellectual skills, conduct a hierarchical analysis to determine the subordinate skills:

- For each goal analysis step, ask "What must the student know before this skill can be learned?" This creates the first hierarchical level.
- For each first level component, ask the same question. This creates a second hierarchical level.
- Continue this as far as needed.

Subordinate psychomotor skills can be derived through a procedural analysis:

- Specify each activity that must be done for each goal analysis step.
- Ask, "What must the student do or know before this step can be done?"
- Continue this as far as needed.

To determine the subordinate attitude skills, conduct at least one of the following instructional analysis techniques:

- For each goal analysis step, ask "What must the student do when showing this attitude?" The answer is usually a cognitive, intellectual, or psychomotor skill. With this information, you can do the appropriate analysis.
- Ask, "Why should learners show this attitude?" The answer is usually verbal information. You should then do a cluster analysis.

For learning to be effective, and to avoid frustration, the instruction and the learners' capabilities must match. Design the instruction for the target population, defined as the widest practical range of learners. Determine the learners' abilities, language level, motivation, interests, and human factors. The end result should determine the entry or basic skills that they must have before the instruction begins.

Learning outcomes, or objectives, are specific, measurable skills that communicate to learners, instructors, and other interested people, what the learners should be able to do after completing the learning. Success occurs when learners achieve the planned outcomes. Learning outcomes form the basis of the subsequent instructional development process.

To write learning outcomes:

(1) Identify specific behaviours through action verbs. The verb needs to be stated at the highest skill and thinking level that the student will need to do. Use the revised Bloom's taxonomy as a foundation for selecting verbs.
(2) Specify the content area after the verb.
(3) Specify applicable conditions. Identify any tools to be used, information to be supplied, constraints, etc.
(4) Specify applicable criteria. Identify any desired levels of speed, accuracy, quality, quantity, etc.
(5) Review each learning outcome to be sure it is complete, clear, and concise.

Glossary

Attitude. Tendency to make particular decisions or choices under specific circumstances.

Bloom's taxonomy. A classification system containing six hierarchical taxonomies for learning outcomes.

Cluster analysis. Analysis used to organize verbal information into logical groupings that are small enough to be learned successfully.

Feedback. Any response related to input.

Goal analysis. The process for providing a visual statement of what the learner will be able to do.

Halo effect. A result in which people behave differently because they are being observed.

Hierarchical analysis. Used to determine the subordinate skills required to learn an intellectual skill.

Instructional design. The process of activities aimed at creating a solution for an instructional problem.

Instructional goals. General skills that will be further defined into specific learning outcomes.

Intellectual skills. Skills that require learners to think rather than simply memorize information.

Learner analysis. Determines information about the student's abilities, language capabilities, motivation, interests, human factors, and learning styles.

Learning outcomes or **objectives**. Specific, measurable skills.

Needs assessment. A method of gathering information for determining the actual problem.

Procedural analysis. Used to derive subordinate psychomotor skills.

Psychomotor skills. Skills that require learners to carry out muscular actions.

Subordinate skills analysis. A process for determining the skills that must be learned before performing a step.

Verbal information. Material, such as names of objects, that learners have to memorize and recall.

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11
Accessibility and Universal Design

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Learning outcomes

After completing this chapter, you should be able to:

- Understand what accessibility means in an online environment, why it is important, and what standards and policies are in place to support it.
- Apply principles of universal design while creating your materials in order to provide online content to ALL students, to assess equally all students' skills, knowledge and attitudes, and to engage and motivate all students.
- Have deeper insight in various types of disabilities, their effect on how people use the Internet, and into assistive technologies that exist to accommodate these disabilities.Analyze how websites are designed, what tools are available for their creation, and how to write for users with disabilities.
- Explore different types of multimedia: their potentials and challenges when using them for online learning with students with disabilities.Apply a checklist to test your site for accessibility and use automated validators;
- Look ahead at some additional resources for learning about accessibility.

Introduction

Most of the content in this chapter is based on the work performed at the University of British Columbia (UBC) as a part of the "Web Content Accessibility" project in the period September 2005 – August 2006.

Great efforts have been made to give every student equal access to high-quality learning, and to remove barriers for people with disabilities. However, most of these efforts are focused on the traditional, face-to-face classroom experience. Less attention is devoted to those taking courses fully online, and their ability or inability to cope with web-based interactive content. While standards and guidelines have been developed to support and assist with accessible web design, their primary focus has been on technical specifications, assistive technologies, or legal issues. Fewer studies have been conducted to investigate how that "accessible" content is perceived from a learner's perspective, and how helpful it really is.

As distance learning adapts to new technology, instructors should be innovative in their relationship with students and in the methods for developing educational content, accommodating the diverse needs and learning styles which will be beneficial for all, regardless of their (dis)abilities.

At the beginning of this chapter you will find a brief description of the situation at post-secondary institutions, regarding adjustments of their online materials to students with disabilities, as well as legal and ethical framework for making modifications. You will find information about, and examples of, applying Universal Design for Learning principles to the online environment for the benefit of everyone. A description of various disabilities will follow, where we will focus on specific student needs. Next, you will learn about legal requirements and existing standards for creating web content. We will describe practical steps and procedures and explain them with respect to different elements of online material design, together with several ways for testing and assessing accessibility. At the end of the chapter you will find a list of additional resources for further exploration.

> "If the basics of usable design are ignored all users can be disabled by the inappropriate use of technology". (P. Jeffels, 2005).

Framework

ACCESSIBILITY AT HIGHER EDUCATION INSTITUTIONS

Universities are increasingly becoming involved in technology-based education programs. The level of sophistication of such offerings (cohort organizations, electronic learning) is accelerating rapidly. However, persons with disabilities, taking courses off campus, are not always provided with the same rights of access and program accommodation as those on-campus. In some cases, slow Internet access is a problem, and in other cases, electronic course offerings coming from the university have not been coded to support adaptive technologies (like screen readers, Braille display, enhanced print size, voice-over, sip and puff control, etc.). The end result is an unfair imbalance in academic access.

Conformance with the **World Wide Web Consortium**'s (W3C, an international organization for developing Web standards) and its **Web Content Accessibility Guidelines** 1.0 will enhance the market share and audience reach of programs by increasing their general **usability**. Adoption of WCAG 1.0 recommendations also demonstrates a commitment to social responsibility and equity of access to education, information and services.

These changes do not have to be substantial to be successful. Web accessibility is usually achieved by careful planning and attention to details. This all translates into **Universal Design for Learning** (UDL), a practice of designing web pages so that they can be navigated and read by everyone, regardless of location, experience, or the type of computer and technology used, In addition, it means providing educational material with flexible goals, instructional and assessments strategies that apply to different learning styles and practices. We will talk more about Universal Design later in this chapter.

Having an increased number of life-long learners, as well as those who are returning to school for their professional development or upgrade, removing barriers to web access becomes even more pressing.

LEGISLATION

In the United States, a law called Section 508 requires federal agencies to ensure that people with disabilities have the same access to information in electronic systems as people without disabilities.

> "Section 508 requires that when Federal agencies develop, procure, maintain, or use electronic and information technology, Federal employees with disabilities have access to and use of information and data that is comparable to the access and use by Federal employees who are not individuals with disabilities, unless an undue burden would be imposed on the agency. Section 508 also requires that individuals with disabilities, who are members of the public seeking information or services from a Federal agency, have access to and use of information and data that is comparable to that provided to the public who are not individuals with disabilities, unless an undue burden would be imposed on the agency" (Section 508, 2006, Subpart A—General, para. 1).

In the United Kingdom, there is a similar law known as SENDA (Special Educational Needs and Disabilities Act) that applies specifically to students.

Canada has no such law at the moment, but the Canadian Human Rights Act and the Charter of Rights and Freedoms both deal with discrimination on the basis of many factors, including disability. A failure to provide information in an accessible manner could be considered discrimination if no reasonable attempt is made to accommodate the disabled person.

The Human Rights and Equal Opportunity Commission (HREOC) in Australia published World Wide Web Access: Disability Discrimination Act Advisory Notes, All government websites are required to follow these policies and guidelines.

Around the world, accessibility and information access issues are being addressed at different levels. The Report on Developments World-Wide on National Information Policy (2001) gives a nice overview of what a number of countries are doing to support all online users, including those with special needs.

BACKGROUND

The term "disability" is very broad, and can include persons with sensory impairments (blind or visually impaired, deaf or hard of hearing), learning disabilities, motor functioning problems, or neurological impairments. The number and severity of challenges increases with the age of the population served—especially in the area of sensory impairment. For example, while the Canadian Federal government reports that the overall disability rate in the total population is about 12.4 percent—for persons between the age of 65 and 74 it increases to 31.2 percent (Statistics Canada, 2001, para. 2).

The main goal is to improve usability and to provide online learners with disabilities, who were academically qualified, with full, fair and equal access to all university services, and programs. It means either redesigning the existing electronic content or developing a new one with accessibility in mind. Usually, you need to do both.

The first step is to carefully look at the courses or modules and determine their level of accessibility. Consultation and collaboration with users, advocacy groups, other university and government agencies, and various experts is very helpful. In the case of the project described here, all the procedures were tested by making adaptations and necessary changes inside WebCT. During this process, it is important that the work does not entail any modification of the academic standards of the university or elimination of the academic evaluation of students.

Making online courses accessible to students with disabilities, i.e., providing easy and consistent navigation structure, and presenting the material in a clear and organized way brings benefit to all students, regardless of their physical and mental condition. Every student is different; everyone has different levels of comfort with new technology, from computer-shy technophobe to web-savvy expert. We are all in the process of adaptation to new tools: in a survey conducted at Renton Technical College in Renton, Washington, in 2002, the highest number of participants (31 percent) reported difficulties in studying and troubles with computers (Microsoft, 2005). It will take a lot of time for computers or similar devices to become as invisible and user-friendly as books, for example. Universal design for learning attempts to reach that "easiness" by improving usability for non-disabled and disabled users alike. It supports persons with low literacy levels, improves search engine listings and resource discovery, repurposes content for multiple formats or devices, increases support for internationalization of courses and assists access for low-bandwidth users.

An inaccessible site in a corporate world may mean a loss of clientele. In an educational setting, the quality of a learning experience is much more difficult to measure, since it is not only a matter of numbers and physical access. With this awareness, content should be presented in a variety of ways in order to meet the online learners' needs. Material that is inaccessible to a student with one type of disability can be offered in an alternative format. It is important to realize, however, that not everything can be made accessible without compromising the value of the learning experience. Teaching visual concepts and explaining different colour schemes, for example, is not fully adaptable for students who are blind. The materials should be made as accessible as possible for most groups of disabled students, but some people ultimately may still be excluded. In those cases, you will need to offer alternative exercises for the affected student, although the production of such materials can be time consuming. The choice of different delivery methods can exist, but only "in ideal world" (Draffan & Rainger, 2006).

Every effort made to increase accessibility will help to disseminate information on accessibility issues and provide a basis for raising awareness not only in British Columbia, where this project was conducted, but in wider academic communities as well.

ACCESSIBILITY AT UNIVERSITIES IN BRITISH COLUMBIA

It is the policy of UBC (and it is similarly stated in virtually every other university policy in North America and Western Europe) that "the University is committed to providing access for students with disabilities while maintaining academic standards" (UBC Student Services, 2006, para. 1). This is in keeping with UBC policy that recognizes its moral and legal duties to provide academic accommodation. The University must remove barriers and provide opportunities to students with a disability, enabling them to access University services, programs and facilities and to be welcome as participating members of the University community. The Policy goes on to note that such accommodation is in accordance with the B.C. Human Rights Code, the Canadian Charter of Rights and Freedoms and US federal law. Universities have worked hard to write and implement policy that improves access to campus buildings, ensures the health and safety of those with disabilities, and which provides appropriate supplementary support in the facilitation of learning.

The External Programs and Learning Technologies office (EPLT) (http://www.eplt.educ.ubc.ca/) acts as the facilitator for all off-campus Faculty of Education programs, both domestic and international at the University of British Columbia, Vancouver, Canada. EPLT seeks to use innovative, efficient and effective delivery vehicles that are first and foremost designed to meet the diverse needs of learners. Furthermore, it provides them with access to the highest quality programs possible by making Web content accessible to a variety of Web-enabled devices, such as phones, handheld devices, kiosks and network appliances.

The second largest university in British Columbia, Simon Fraser University has a Centre for Students with Disabilities (CSD), which primarily offers services to students on campus, similar to UBC's Access and Diversity—Disability Resource Centre (http://www.students.ubc.ca/access.drc.cmf).

Universal design

The first six sections of this chapter discuss how to address accessibility issues for an online environment, along with resources, activities, and assessments, used with face-to-face coursework or a fully online course. If you are just starting out, then you can address these issues and numerous others from the beginning by using **Universal Design for Learning** (UDL) principles. UDL builds upon universal design concepts from other fields, such as architecture and urban planning, and applies them to learning situations.

The "curb cut" is a common urban planning example used to demonstrate the fundamental idea of UDL. Since the Americans with Disabilities Act of 1990, curb cuts—ramps extending from the street up to the sidewalk—must be present on sidewalks. Curb cuts allow people who use wheelchairs or who have low mobility to go from sidewalk to street and back again more easily. However, to add a curb cut to an existing sidewalk requires a jackhammer and a lot of extra work. Making a sidewalk that was designed with a curb cut from the beginning is much easier. Coming back to UDL, it is often easier to accommodate different learning needs by designing the course with those needs in mind.

As we will see with accessibility solutions for online learning, the curb cut accommodates everyone, not just the original intended audience. Parents with strollers, children walking their bicycles, skateboarders, and more benefit from curb cuts just as much as people in wheelchairs. Along the same lines, the Center for Applied Special Technology (CAST) refers to UDL as "Teaching Every Student," stating that Universal Design for Learning "calls for

- multiple means of representation to give learners various ways of acquiring information and knowledge,
- multiple means of expression to provide learners alternatives for demonstrating what they know, and
- multiple means of engagement to tap into learners' interests, challenge them appropriately, and motivate them to learn." (http://www.cast.org/research/udl/index.html)

Almost every online accessibility accommodation strategy designed for students with disabilities also helps additional students. For example, English language learners (ESL students) frequently use screen readers that were originally created for people who are blind or who have visual impairments. They benefit from hearing the text spoken out loud as they read a passage of text. Overall, UDL assists students with disabilities, certainly, but also assists students who are non-native language speakers, students with different learning styles, students with different levels of Internet connectivity and access to technology, and even students who require more assistance with self-motivation. Let's take a look at different ways to apply Universal Design for Learning to your online course.

MULTIPLE MEANS OF REPRESENTATION

You probably remember teachers whom you felt gave you everything you needed to succeed when you were a student. These teachers provided handouts in the classroom, links to resources on the Internet, copies of their presentations, and more. You may also remember teachers who did not provide many resources. The resources they did provide may have been text-only documents or handouts that helped a select few students in the class. Perhaps they made one copy of an important set of materials for checkout, requiring you to wait until someone else turned it in before you could review it. This section will give you ideas about ways in which you and, in some cases, your students can provide alternative course materials and resources that increase the number of students who succeed in reaching the objectives.

Sensory input

First, we need to consider the different ways that people get information into their heads and the types of resources that students prefer. Later, we will discuss ways to help students encode and retain any knowledge or skills that they need to succeed in your class or beyond.

Visual-verbal, or text-based resources, help learners who prefer to read. These are usually the most common type of online learning resource, ranging from documents and presentations to web pages. However, text-based resources must be made accessible to people with visual impairments, such as using Optical Character Recognition (OCR) to convert scanned documents to text.

Saving text-based files or documents in various formats also impacts how many people can use them. Consider which technologies your students can access at home, school, or work. Some instructors conduct a short survey at the beginning of a school term to see which software applications students use. Then they save their files in the most common format for that class. Others will save their course documents and text-based class assignments in multiple formats. such as accessible Portable Document Format (PDF) files, Rich Text Format (RTF) files, Hypertext Markup Language (HTML) files, and Microsoft Word (DOC) files. Still others choose a standard format for the class and inform the students that they will need certain software to read, edit, or save course documents.

Each document format listed above has its limitations, so choosing them may depend on what you want to accomplish.

- Any student can open PDF files with a free application called Adobe Reader, available for download at the Adobe website. If you choose this format, you should also provide your students with a link to the download page. However, if students are required to edit the document or to provide feedback on it, then they will require a different application, Adobe Acrobat, that is not free.
- Almost any word processing application can open RTF files, but saving as an RTF file may remove certain types of advanced formatting. Apart from this limitation, this format provides a great deal of flexibility with the types of tasks accomplished through the documents.
- Students with access to a web browser can open HTML files. If you want students to work on an HTML document, though, they will need a web-based HTML editor, an HTML editing application, or a simple text editor combined with knowledge of HTML code.
- Microsoft Word, or DOC, files offer additional options, such as a feature called tracking that allows students to see feedback and suggested changes.

> Many people have a copy of Microsoft Word, but it is not universal. Student bookstores and some computer stores carry discounted educational licenses. If you are going to require students to use Microsoft Word, let them know of any labs at your school or university that make it available to those who cannot afford it.

Other text-based file types, such as spreadsheets, provide fewer options. The most common spreadsheet format is a Microsoft Excel (XLS) file. All spreadsheet applications should be able to save files as a Comma Separated Values (CSV) file. However, this would strip out any formulas or calculations that you or the students use.

Looking at ways to spread out your workload over time, you can start with the first strategy, or saving files in one or two of the most common formats for your class, and work your way to the second strategy, or saving files in multiple formats, over time. This does not have to be done in a day, but to achieve Universal Design for Learning it is important to consider these strategies from the beginning. The concept is not to try to accommodate all students with one strategy, but to provide alternatives. The key is to let your students know which formats you will use and provide them with avenues to get what they need to read and use the text-based resources.

Visual-nonverbal, or graphic-based resources, assist learners who prefer graphic-based visual resources, such as images, charts, graphs, flow charts, animations, or videos. Many software applications and some websites allow you to embed charts and graphs within the file itself. You can easily insert images in Microsoft Word. Microsoft Excel allows you and students to create different types of graphs from the data tables. If you use a complex image, such as a political map or a diagram of the digestive system, you must still provide a text-based description for students who use screen readers.

You can use different applications, such as Inspiration, to create stand-alone flow charts or concept maps. If you want young students to be able to interact with this type of file or to create their own, there is a version called Kidspiration as well. See the Inspiration website (http://inspiration.com) for more details. By pushing one button, students can convert Inspiration flow chart or brainstorm files to text-based outlines. This helps students with screen readers as well as visual-verbal learners who prefer the text. Other applications like Inspiration include Microsoft Visio, a free application called SmartDraw, and others. For specialized applications, such as engineering, there are even more. Let your students know if they will need to download or buy any additional software for your course, and work with lab managers to install it at your school or campus if budget permits.

Auditory resources provide alternatives to learners who prefer to hear the information, rather than read it. Screen reader software and text-to-speech applications can be used by many students, not just those students with vision impairments. Schools and universities have different ratios or formulas for how many computer lab stations must have this type of software to accommodate special needs. These ratios usually range from one in twelve to one in twenty computers per lab environment.

In addition, there are other avenues to provide auditory resources to students. For decades, students have placed their tape recorders at the front of the classroom to capture what the instructor says for playback later. These days, the instructor can record him or herself and post the audio file online for all students. As with the other file types, it is important that the students can play and use the files you create. Common audio file formats include the Wave (WAV) file created by Microsoft, the Audio Interchange File Format (AIFF) created by Apple, and the Moving Picture Experts Group's Audio Layer-3 (MP3) file.

A recent, popular trend for creating and distributing MP3 audio files is called "podcasting." Different aspects of podcasts and the process of creating and distributing them are described in Chapters 21, Media Selection, and 26, Techno Expression. For our purposes here, it is important to note that you should provide a transcript for any audio files.

Video files also provide appropriate stimuli to auditory learners. Chapter 21, Media Selection, discusses when it is or is not legal to use clips of copyrighted videos as course related resources. One important factor from a UDL standpoint is that streaming video files are often easier for all students to use than downloadable video files. Despite the progress related to high-speed connectivity, not every student has a Digital Subscriber Line (DSL) or equivalent connection at their home, school, or workplace. For students using a dial-up modem, large video files present a very frustrating challenge. Many times the student will spend hours trying to download a large file with no success and will give up. For purposes of accessibility, caption the video or provide a transcript with timecode references to scene changes or other important points.

Tactile/Kinesthetic resources create opportunities for learners who prefer to learn by doing. Resources that accommodate tactile/kinesthetic learners can take different forms. First, you can find or create interactive resources, such as CD-ROMs, websites, or Flash animations, and require the student to follow a linear or non-linear path through course-specific material. If you do not have time or know how to make these yourself, then you can search a variety of online clearinghouses and repositories for appropriate learning resources. The Multimedia Educational Resource for Learning and Online Teaching, or MERLOT (http://www.merlot.org), is a free website containing thousands of learning resources in the fields of Art, Business, Education, Humanities, Math and Statistics, Science and Technology, and Social Sciences. MERLOT is primarily for higher education instructors, but some materials would be appropriate for secondary school students as well.

Next, you can ask the students to create the resource. In the online environment, this can be as simple as requiring all students to build a glossary of terms for a chapter or topic. You can ask them to send their terms by email, to post them to a threaded discussion, or to post them using a glossary tool that comes with a Learning Management System like Moodle. Other types of student-created resources include databases or spreadsheets containing results of experiments, student or class websites, and student videos.

Finally, more advanced resources act as a framework for student activity, described below. For example, a WebQuest (see http://www.webquest.org) is a web-based research activity that you can find or create for student group work. While most WebQuests are for K–12 students, it is not difficult to create one appropriate for college or university students. The WebQuest is highly interactive and collaborative, making it an ideal online resource for tactile/kinesthetic learners.

Keep in mind that not every resource for students must be stored in the online environment. Some of the most interesting and meaningful lessons require students to interact with the world and then to come back and reflect or report on what they learned. For all types of learners, this increases the number of possible resources to global proportions … literally! Structured activities might involve students performing lab experiments and then completing online lab notebooks; collecting scientific data and then entering it into a communal online database; observing master teachers at a school and then writing a reflective weblog entry; or interviewing an expert and then posting the text, audio, or video file.

Combining strategies means that you can accommodate greater numbers of learning preferences with one resource or activity. For instance, if you use an Excel spreadsheet to demonstrate how increasing and decreasing budgets affected the North and the South in the US Civil War, you can require the students to fill in the annual budget numbers themselves and then to create a graph. This strategy accommodates visual-verbal (text-based) learners, visual-nonverbal (graphic-based) learners and tactile/kinesthetic learners.

Perception

Sensory learners prefer fact-based activities and resources. These resources are easier to provide, as most disciplines from the humanities to the sciences have some facts or details related to the topics within. The easiest resources to provide might be references to the textbook, or links to related websites. More in-depth resources could include optional readings, such as advanced articles that apply the concepts discussed in class.

Intuitive learners like reflective activities and resources that require imagination. If you have a topic that requires students to memorize facts to lay a foundation for later application, provide additional, optional resources that introduce the theories related to the facts. You can also encourage students to seek their own connections between theory and facts using an optional activity, such as a discussion forum devoted to a discovery learning approach.

Organization

Inductive learners prefer beginning with meaningful examples before extrapolating the main concepts or theories. In the online environment, you can accommodate inductive learners in both passive and active ways. You can provide a number of examples in a recorded lecturette before describing the concept that they exemplify. In a more active learning activity, you can provide a number of examples and require the students to create a generalization from them by defining patterns. The Biology Success! Project (see the Final Resources section for details) encourages instructors to consider that while inductive activities have been proven to help students with learning disabilities, "it is essential that the instructor create clear guidelines for behavior, provide explicit directions from the outset of the activity, and be prepared to offer extra guidance as necessary."

Deductive learners prefer starting with more structure, deriving consequences and applications from the concepts and theories. These learners benefit from demonstrations and opportunities to practise what they have learned. Online "lab" experiences can further strengthen or confirm the learning by deductive learners.

To accommodate both inductive and deductive learners, you can provide case studies, results from previous experiments, and other inductive examples alongside descriptions of the general concepts and theories for the deductive learners. You can assign both in whichever order the students prefer, or alternate the order for different assignments whenever applicable. Another method to accommodate both types of learners is a "structured inquiry" exercise. Whichever approach and activity you choose, remember to be clear about what is expected or what students should do. Identifying the instructor's expectations is not a discovery learning exercise!

Processing

Active learners enjoy learning by applying knowledge or by working with others. Providing areas where students can interact online, such as instant message (IM) environments, discussion forums, or wikis, will give these students a way to do this. Learning Management Systems usually contain several of these tools for interaction. These tools can be used to create both general course spaces for interaction—related to coursework only, of course—and specific spaces for particular topics or assignments. It is important to create clear instructions and expectations for each interaction space, so students know its purpose and whether or not participation is required.

Make sure that you test the true accessibility of any technology-based areas for interaction. While many companies state that their web-based tools are accessible or compliant, their products are sometimes difficult to use for students using adaptive technologies. You might want to work with a disability resource centre to do some preliminary testing. Further, interaction tools that use Java-based applets or plug-ins do not work with some older browsers, excluding a different group of your students—those with limited technology or limited access to technology.

Reflective learners prefer to ponder the concepts or topic before engaging with it. If you often use small groups in your course, provide opportunities for individual assignments, even if it is just a precursor to the upcoming group work.

People often see themselves as both active and reflective learners, just as they might consider themselves both sensory and intuitive. Therefore, you can try to accommodate both types of learners by mixing up the types of activities. An active learner might prefer the immediacy of a chat. A reflective learner might prefer the asynchronous nature of a discussion forum, as it allows him or her to think about what they want to write before actually committing the words to print.

Understanding

Global learners prefer to see the "big picture" first. Therefore, you can help these students by providing resources that summarize a concept before going into details. One of the simplest examples entails creating a table of contents for a presentation that you post online. If you are creating an audio file, take some time to give a brief introduction to the lecturette or presentation before diving into the first section.

Sequential learners prefer a step-by-step approach, understanding each piece before seeing how it fits in a larger context. One way that you can help sequential learners involves referring to a numbered outline so students can keep track of where you are. Be sure to review flow charts, presentations, and other resources to make sure that you have not skipped or glossed over any steps. If creating audio readings, avoid jumping around from topic to topic. Instead, follow the outline that students will use to keep track of their place.

A common piece of advice for people delivering a presentation for the first time is "Summarize what you are going to say, say it, and then summarize what you said." This advice accommodates both global and sequential learners.

Preparing students to use multiple means of representation

If students are not prepared to use the variety of content choices you provide, then all your work could be wasted. Let them know how important it is for them to understand the concepts of learning preferences and learning needs, how to determine what their preferences and needs are, and how to adopt strategies that accommodate them. Many instructors ask their students to complete a learning styles survey. This idea is described in more detail below. We can include the learning needs of students with disabilities in this same set of activities. Students with various disabilities also may not know what strategies will benefit them in the online environment. Encourage them to explore how they can succeed in the online components of your course, either on their own or with the help of a disability resource centre.

MULTIPLE MEANS OF EXPRESSION

When we think about asking students to demonstrate what they know, we usually think that each student will take the same test, complete the same essay assignment, or perform the same skill(s). It is not too strange, though, to think that students could use different methods to show that they know the same concept. After all, instructors often ask students to choose one of several essay questions to demonstrate understanding of a major topic. These days, instructors are asking students to submit portfolio pieces, sometimes called "assets" or "artifacts," to show particular competencies. In this process, they may even let the students choose what type of asset they would prefer to submit or how to best show their knowledge or skills. This last idea exemplifies the principle of "multiple means of expression."

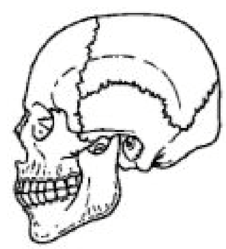
Individuals

When asking individual students to demonstrate knowledge, skills, and/or attitudes using online mechanisms, it is important to determine to what degree of difficulty you are asking the students to achieve the objectives. There are numerous websites that list the different levels of difficulty related to the three learning domains: Cognitive (knowledge), Psychomotor (skills), and Affective (attitudes) (see description of learning domains and degrees of difficulty http://www.nwlink.com/~donclark/hrd/bloom.html). Once you determine what you want students to do, then you can determine how they will demonstrate it. This book contains more information about student activity (Chapter 20, Instructional Strategies) and assessment (Chapter 14, Assessment and Evaluation).

The first step is to identify alternatives that are equivalent. Taking a multiple choice test does not usually demonstrate the same level of proficiency as writing an essay or performing a task in front of a video camera for evaluation later. Therefore, take a close look at the learning objectives, and then make a list of different ways that students could achieve those objectives. Consider the following example objective, "Students will translate Hamlet's famous 'to be or not to be' soliloquy into modern English (with or without slang)." Equivalent online assessment alternatives might include writing a translation in a discussion forum, posting a translation as an attachment, making an online presentation using Skype or other synchronous conference tool, making and posting an audio recording of the student reading their translation, or making and posting a video presentation. The same evaluation guidelines or rubric could be used to evaluate each one. Hypothetically, then, students could choose how they want to show their ability to translate the soliloquy. This accommodates students with disabilities as well as students with different learning preferences. It also creates an avenue to engage students at a higher level, which is described in depth below.

Of course, you will find that certain alternatives may be less equitable. For example, technologies like video cameras and video editing software could be equally difficult to use due to limited access, unequal proficiency levels, or physical disabilities. This does not mean that you have to immediately remove it from the list of options. However, it might require that you identify a lab that checks out cameras to students and that has computers with video editing applications. Another option might be to have students work in small groups, so they can give each other feedback, share technology resources, and help each other with the technology skills that are not part of your course objectives. For an assessment strategy to be universally accessible, students must be able to attempt each alternative, so you may need to limit the options to those that you know all students can try if they wish.

Even within a standardized test format, there may be ways to offer options to students. In a face-to-face environment there are ways to accommodate different needs without giving test answers to the student. For example, on a test requiring students to identify the different bones in the skull, the instructor can provide a three-dimensional model of a skull for a blind student to use instead of a flat image (see Figure 11.1 below). The same option is possible for an online test, but it would still require the student to have the model skull at an online testing location.



2-dimensional skull diagram

3-dimensional skull model

Figure 11.1 Test format options

As stated earlier in this section, activities that involve specialized software or online environments should be tested for accessibility and assessed related to how many students have access to the software or environment itself. However, many of the tools go beyond the simple process of creating and automatically grading test questions. Learning Management Systems (described in Chapter 7, Learning Management Systems) offer a variety of testing options, such as creating separate versions of a timed test to accommodate students who need extra time for exams. The Biology Success! Teaching Diverse

Learners project (n.d.) gives us "Key Principles of Assessment as Applied to Students with Learning Disabilities" that we can use in the online environment, too:

- Make clear all assessment criteria
- Make assessments frequent
- Allow for ongoing revision of student work
- Use varied and alternative assessments
- [Provide opportunities for student] self-assessment

Groups

Group work in the online environment provides some real challenges and some tangible benefits. It is sometimes hard to keep track of which student has contributed to the team effort, but students will all gain team-related experience that will help them in research and work environments. One strategy to determine each group member's contributions is to have each student first perform each group task individually. Then each group member can share his or her work online, using a discussion forum, wiki, or other collaboration tool, to combine the best efforts from the team as a whole. Another strategy involves assigning specific roles to each group member. Most WebQuest exercises (briefly described above) require students to take a role and complete tasks accordingly. Then each student's work can be assessed individually, in addition to assessing the level of team or group success.

Entire class

The whole class can construct knowledge together in various ways. It is difficult to give the entire class multiple, simultaneous avenues to show it can achieve a certain goal. However, you can construct assignments and activities over the course of the term that gives the class different ways to achieve the desired goals. One way to do this is to assign small groups to make presentations about each week's content. As you go through a term, the entire class has an opportunity to add to a growing knowledge base of course-related material.

MULTIPLE MEANS OF ENGAGEMENT

Just as students have different learning preferences and different learning needs, they have different motivations, and levels of motivation, to be successful learners. A certain number of students may be the first member of their family to attend college, so they want to do well. Some may want to achieve financial independence, so they put in extra effort to have high level skills and high quality products to show potential employers. Others may just have a passion for the discipline or specific course content. The UDL principle, "multiple means of engagement," tells us that we should find out what motivates our students and to challenge them to use those motivations to be successful online learners.

Involve students in the process

To whatever extent you feel comfortable, involve the students in the process of preparing and conducting the online portion of your course or your fully online course. Just as the chemistry of each face-to-face class is different—sometimes the group is energetic or rambunctious, sometimes the group is quiet and difficult to motivate—each online cohort is different. After defining the course objectives, provide a forum for the students to state their expectations. Most times, you will find that the student expectations are very similar to your objectives, but with a different focus, such as applying the knowledge to get a job or using skills from the course to create a portfolio demonstrating their abilities. Using your syllabus, an opening statement, or other strategy, encourage students with special needs to tell you what strategies they have found helpful for their success in past experiences with online coursework. They may already have accessibility or even UDL solutions that could save you countless hours of research.

Another way to engage students is to involve them in their own learning. In the Multiple Means of Representation subsection above, we cover different ways to accommodate learning styles, learning preferences, learning needs, and so on. However, as an instructor, there is only so much you can do before the student must take responsibility for him or herself. Ask your students to take an Index of Learning Styles (ILS) questionnaire, such as the one created by Richard Felder and Barbara Solomon of North Carolina State University (listed in the Final Resources section) Then have the students report what they find about themselves and identify strategies that they will use to improve their own learning. Sometimes the questionnaire results do not match how we see ourselves. That is okay. Just let your students know that this exercise is to make them aware of different learning possibilities. They should try strategies that accommodate their perceived learning styles as well as the ones that the questionnaire results identify for them.

Determine what students find meaningful

To keep students motivated to work in the online environment, they will need to find the objectives, topics, resources, and activities meaningful. An instructor-led approach could range from "This material is a prerequisite to other courses in this program" to "These skills will help you get jobs in this field." A student-led approach could range from "This is how these theories apply to real-world events" to "Some of you will find this really cool!" Both approaches have their merits, so use them together. To determine what real-world events interest students, or to find what they feel is really cool, talk to some of the students before the term gets rolling, or ask the class to send you one idea of each.

Ask for feedback

In Chapter 24, Evaluating and Improving Online Teaching Effectiveness, we cover a number of ways to get feedback from students. Using those strategies, you can include questions about motivation or engagement to learn how well you are doing to get students more involved in their learning success. Go over the results with the class to come up with additional ideas or inspirations.

BRINGING IT ALL TOGETHER

Looking at some of the concepts and suggestions in this section, you might be asking yourself, "This is helpful, but what does this have to do with accessibility?" For this book, remember that the term "accessibility" refers to the extent to which it is possible for all students to succeed in our collective online course environments.

About Web accessibility

WHAT MAKES A SITE ACCESSIBLE?

Accessibility is about making sure *all the information* on your website is available to *all users*, regardless of any disability they may have or special technology they may be using.

> "Accessibility involves making allowances for characteristics a person cannot readily change"'. (Building Accessible Website, Joe Clark)

WHY BOTHER?

Fairness and equality

The simplest and most direct answer to this is that if your site is inaccessible to users with disabilities, you are excluding a section of the population from your content. If your students cannot access the course materials, they could be placed at a distinct disadvantage and their coursework could suffer as a result.

Accessibility benefits usability

Many site designers and developers drag their feet and grumble when asked to make their site accessible. There is a mistaken perception that "accessibility" means "dumbing down" the site—that they won't be allowed to use any graphics or any multimedia. Frequently, websites address accessibility by making a plain, text-only version of every page and labelling it "accessible". This does no one any favours—it requires the webmaster to maintain twice the number of pages, and provides an inelegant solution that lumps all disabled users into the same category.

The reality is that accessibility is a way of enhancing your web page, and it can be done seamlessly without taking away from the design. Many accessibility recommendations and guidelines actually improve the integrity of your code and the overall usability of your interface. Usability is, simply put, how easy it is for people to use your site.

Anything you can do to improve accessibility can also improve usability for people without *disabilities, for online courses or any other kind of website.* Consider these examples:

- you have made the menus consistent on every page—now everybody has an easier time finding their way around your site, because the buttons are always in the same place;
- you have made sure your font size can be adjusted—now older readers with poor vision can increase the size of the text to see it better;
- you have set a unique page title for each page—now search engines can more accurately display your pages in their search results;
- you have added a text description for each image—now someone browsing with images turned off can tell if they are missing an important diagram;
- you have added captioning to a video—now a student using a computer in a public lab can watch it too without needing sound;
- you haveadded an audio reading of an important passage—now a student who learns better aurally can enjoy the reading as well.

Legal reasons

As we have already discussed, many institutions are obligated to provide accessible content according to national laws.

ACCESSIBILITY STANDARDS

There is a set of guidelines developed by the World Wide Web Consortium (W3C), a group that establishes specifications, guidelines, software and tools for various aspects of the Web, including file formats and scripting languages. One W3C program is the **Web Accessibility Initiative** (WAI), whose mission is to help make the Web accessible to people with disabilities. The WAI has developed the Web Content Accessibility Guidelines (WCAG) to address the accessibility of information in a website. These guidelines are what we will be using in this chapter, and should always be consulted if you are ever in any doubt of the best technique or the correct syntax of a tag. They are fairly technical, and not a quick read. However, two simplified versions of these guidelines organized by concept do exist as Appendices of WCAG 1.0 (1999a and 1999b), both as a checklist table and as a list of checkpoints. At the time of writing, the current version of the guidelines is WCAG 1.0, and WCAG 2.0 is under review.

These guidelines, relevant to online content developers, help to ensure that Web resources are accessible. However, there is a need to recognize the limitations of these guidelines as well as the available checking tools (Ivory & Chevalier, 2002). Kelly and Sloan (2005) talk about the difficulties of implementing the guidelines, summarizing the concerns in regards to ambiguity, complexity, logical flaws and the level of understanding required to implement them.

Despite the difficulties with the guidelines' implementation and reliability, and the necessity of manual checking for accessibility, WCAG are very helpful in the initial stage of developing an online resource, as a quick checklist of obvious things that need fixing. The guidelines should not be taken as the only set of criteria that needs to be considered. A wider set of issues must be addressed, some of which could be in conflict with the guidelines.

PRIORITY AND LEVELS OF CONFORMANCE

Each checkpoint has a *priority level* assigned by the working group based on the checkpoint's impact on accessibility.

- **Priority 1**: A Web content developer *must* satisfy this checkpoint. Otherwise, one or more groups will find it impossible to access information in the document. Satisfying this checkpoint is a basic requirement for some groups to be able to use Web documents.
- **Priority 2**: A Web content developer *should* satisfy this checkpoint. Otherwise, one or more groups will find it difficult to access information in the document. Satisfying this checkpoint will remove significant barriers to accessing Web documents.
- **Priority 3**: A Web content developer *may* address this checkpoint. Otherwise, one or more groups will find it somewhat difficult to access information in the document. Satisfying this checkpoint will improve access to Web documents.

Depending on which priority checkpoints a site meets, it can claim to meet a particular *level of conformance.*

- **Conformance Level "A":** all Priority 1 checkpoints are satisfied.
- **Conformance Level "Double-A":** all Priority 1 and 2 checkpoints are satisfied.
- **Conformance Level "Triple-A":** all Priority 1, 2, and 3 checkpoints are satisfied.

TESTING FOR ACCESSIBILITY

There are a number of tools available to help you check some of the more technical aspects of your website to see if it meets accessibility standards. One of these is WebXact Watchfire (http://webxact.watchfire.com/), previously known as Bobby. It is a very handy tool for double-checking that all your images have **alt text**, or that your data tables are properly labelled.

But these tools are not the whole picture. An accessibility analyzer like Watchfire cannot tell you if the descriptions of your images make sense to a blind user, or if your page titles are meaningful. Your website needs to be considered from a human perspective, and many of the WAI guidelines ask you to examine the context and meaning of your content more carefully.

Students with disabilities

WHO IS AFFECTED?

When we talk about making the Web accessible for people with disabilities, who are the people we are talking about? Before we can learn what to do with our web pages, we need to understand what we are doing and who we are doing it for.

Tip: Simulations
To help you understand what web navigation is like for people with disabilities, some organizations have developed simulations:

- Inaccessible website demonstration—http://www.drc.gov.uk/newsroom/website1.asp
- WebAIM simulations—http://www.webaim.org/simulations/

SIGHT

The first group that most people think of when considering accessibility for the Web is the blind and visually impaired.

Blind: Users have little or no usable vision. While a few users may use Braille, the majority use a **screen reader**—software that reads text out loud. Some people listen to the Web at speeds that sighted users find completely incomprehensible—the audio equivalent of "skimming" a page. Keep in mind that screen readers read everything that they encounter, and that they read it in the order they find it. In some cases, users with screen readers encounter online multimedia elements that start playing without warning. They must contend with two audio sources at the same time: the screen reader reading the web page text and the multimedia audio.

Visually impaired: Users may have some sight, but difficulty focusing or distinguishing small text. They may use a **screen magnifier**—software that enlarges everything on the screen to a more manageable size.

Colour blind: Most colour blindness involves difficulties distinguishing red and green. A smaller percentage of people have difficulties with the blue-purple portion of the colour spectrum. Still others are completely colour blind. There is a misconception that accessibility means using only black and white text, and that colour should be avoided. This is not true. The point is not to rely on the requirement of colour perception to reveal information. For example: asking readers (or learners) to "use only words in red to compose a paragraph", or telling readers while filling in the form, that only "blue" fields are required.

As we will find, making the Web's highly visual content accessible is not as daunting a task as it might seem. There are methods in place for providing alternatives for nearly every type of web content, and for making sure your content works well with the specialized hardware and software used.

Tip

- Ever wondered what the world looks like to colour-blind people? Test out Vischeck, a colour-blindness simulator, on your site or any image. http://www.vischeck.com
- WebAIM simulations—
  http://www.webaim.org/simulations/

HEARING

Since the majority of content on the Web is visual, students who are deaf or hard-of-hearing are not as likely to be affected. However, they often have communication and comprehension difficulties. If audio files or videos are a part of the curriculum, a text alternative should be provided. Many users will also benefit from easily understandable icons and clear terminology.

Ideally, videos should be **captioned**. Professional captioning can be costly, though for course materials requiring extremely high accuracy (such as math and physics equations), it may be the best choice. Software is also available to allow you to include captions in your videos yourself. If captioning is simply not an option, a text **transcript** of the video would be a reasonable alternative.

Tip

Hearing people might assume that hard-of-hearing or deaf students would be reluctant to watch a video clip. But on the contrary, many find video and multimedia material entertaining and especially valuable because of all the other non-verbal communication that they convey. Samuel, a hard-of-hearing ESL student in our focus group, greatly preferred videos or webcam interactions to text so that he could see the emotions and gestures of the other person. For students who can lip-read, video is still helpful if the speaker's face is clearly visible at all times.

MOBILITY

Students with physical disabilities may be affected if their impairment hinders their ability to use a mouse or keyboard. This could be due to having little or no muscle control, nerve damage, or trembling; it could be a temporary problem, a lifelong condition, or the result of aging. Fine motor movements can pose a challenge, such as clicking on a very small icon.

Some users with mobility impairments will use a typical keyboard or mouse, but may take more time to perform tasks. Others use assistive input devices instead or in addition to a keyboard or mouse.

- A standard **trackball** is often easier to control than a mouse. Some students use a standard **graphics tablet** since touching locations directly with a pen is easier for him than sliding a mouse.
- **Alternative keyboards** allow users to position their hands more comfortably, or to press keys more accurately.
- For people who cannot use their hands at all, **head-tracking** allows the user to control the pointer through head movements. Mouse clicks can be replaced with a breath-controlled **sip/puff switch** or tappable **headswitch**.

LEARNING AND COGNITIVE

While visual, hearing and physical disabilities are the most familiar forms of disability, the majority of students you may encounter who have a registered disability may in fact be learning disabled. **Learning disability** or "learning difficulty" is a broad term that includes dyslexia, brain injury, and aphasia.

> "Dyslexia is the most commonly registered disability within the University and always features in the most commonly asked questions on accessibility issues by staff." (Jeffels & Marston, 2003)

Students affected by learning disabilities may encounter difficulties with some of the following activities, among others:

- spelling
- reading aloud; stuttering
- mathematical calculations
- comprehension of large passages of text
- effective time management or organization
- rote memorization
- concentration and focus

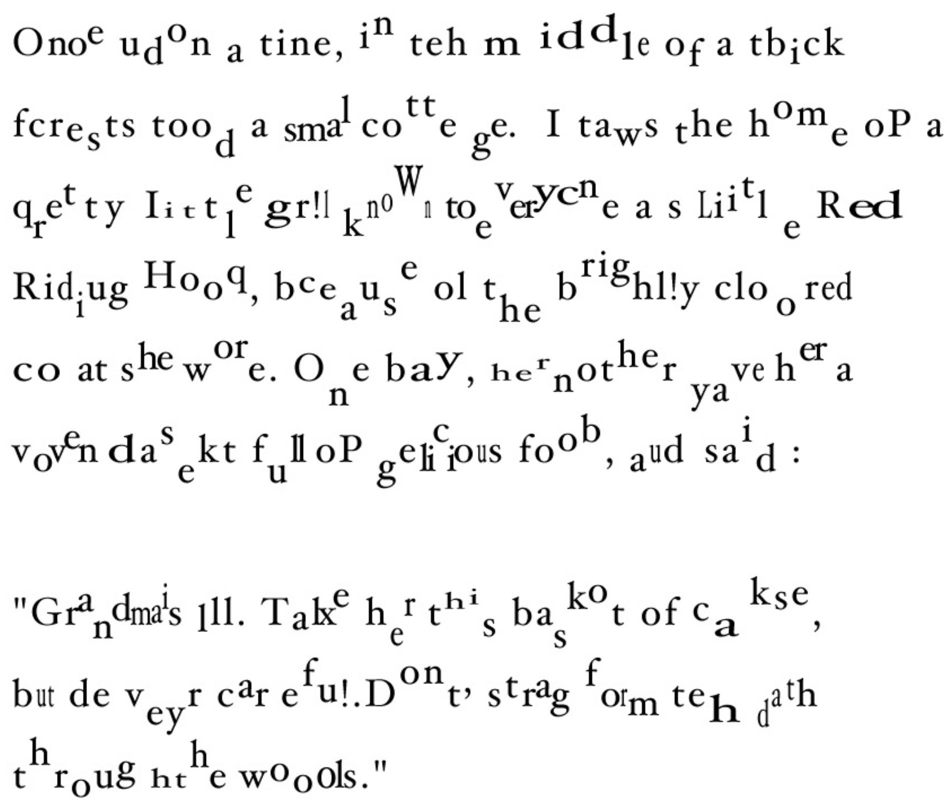


Figure 11.2 Dancing letters

Try to read the passage in Figure 11.2. It may give you an idea of the difficulty and frustration experienced by many dyslexic readers, as seemingly normal text requires extra effort and concentration to parse.

Learning and cognitive disabilities are a challenging group to address, as there is no one approach that will suit everyone. Some students may learn just as quickly or more quickly than typical students when information is presented in a different medium. Some use the same technologies used by the visually impaired, such as screen readers and speech recognition software. Nevertheless, clear presentation and good navigation is critical. A variety of multimedia options will apply to different visual, auditory and learning skills.

Table 11.1. Content developed using traditional approach and suggestions for adaptations

Traditional approach	Adapted
Lecture type content	Chunks, include questions, statements of clarification and key points
Text-based content	Alternative presentation: audio, video, hands-on interaction; scaffold for various resources (preselect them)
Reading from a textbook	Offer vocabulary, issues to discuss in the forum, encourage note-taking, using graphic organizers, offer information prompts (self-tests with open ended questions)
Assignments: written essay	Offer a choice: written, oral, video or visual presentation
Assessment	Offer variety in responses: open-ended questions, oral response Give clear scoring rubrics, be prompt and detailed in giving feedback

AGING USERS

When considering accessibility in education, most people assume they will need to prepare for a few isolated examples of students with disabilities: one blind student in a class, or a handful of young students with learning issues. As we age, we may be affected by *any* of these types of disabilities to various degrees. Instructors should be aware that some of their older students may also have problems such as fading eyesight, or difficulty with fine mouse movements.

ASSISTIVE TECHNOLOGY

We have touched briefly on the idea of assistive technology, which is essentially any software or hardware that can be used to help overcome a disability.

> **Tip**
> A pair of glasses could be considered assistive technology, as it helps the user overcome poor vision.

Instead of thinking about assistive technology in terms of types of disabilities it assists, let's look at it from the point of view what kind of help it offers. Assistive technology could provide:

- help with accessing a computer
- help with reading
- help with writing (composing, spelling, typing)
- help with communication
- help with learning
- help with hearing and vision

Figure 11.3 lists many of the computing issues for users with disabilities, and suggests some of the common hardware and software solutions used to overcome these problems.

Designing and structuring online content

DESIGN AND STRUCTURE

Don't throw away your art supplies!

One of the most common misconceptions about accessible web design is that in order for a site to be accessible, it must have a simple, plain design with few or no images. Another myth is that an adequate, accessible site can be made by providing a "text-only" version of an existing website. This is a nuisance to maintain, as it requires you to keep not one but *two* versions of every single page.

Remember, not all disabled students are blind! People with mobility or hearing issues and even poor eyesight will certainly appreciate a well-thought-out, aesthetically pleasing website as much as anyone. As you'll see, many of your accessibility changes will be tucked away in the code of your pages, where they will be a benefit to disabled users without detracting from your site in any way.

Activity	Issue	Assistive Technology Examples
 Computer Access	When a student cannot access a computer with a standard keyboard and a mouse, he may need special input devices. These devices are commonly used by students with physical, visual or cognitive disabilities.	**Software**: OS accessibility features, word prediction, keystroke reduction, voice recognition, on-screen keyboard **Hardware**: Keyguard, arm support, trackball, trackpad, joystick, alternative keyboard, switch with Morse code, switch with scanning
 Communication	For many autistic people and some with learning disabilities, augmentative & alternative communication devices may be helpful. They use symbols, pictures and printed words.	**Software**: Symbol browser, art activities, games on the computer **Hardware**: Voice output devices or devices with speech synthesis for typing
 Reading	The low resolution of monitors can cause fatigue and eye strain for all users. For those with vision or learning issues, reading onscreen can be an added deterrent. Keeping track, following a line of text, understanding and remembering can be problematic.	**Software**: Talking electronic device/software to "pronounce" challenging words, electronic books, mindmapping, talking calculator, voice recognition **Hardware**: Single word scanners, scanner with OCR and talking word processor, hand-held scanners, hand-held computers
 Writing	There are two different accessibility issues when using computers for writing: 1) physical problems with typing; and 2) cognitive problems with composing and organizing ideas and converting them into written expression.	**Software**: Templates, word processors, voice recognition, talking dictionary, spelling & grammar checker, multimedia software for expression of ideas **Hardware**: Alternative keyboards and input devices used as for Computer Access (above)
 Learning	Students with learning difficulties may have problems with attention and with organizing ideas.	**Software**: Multimedia software for expression of ideas, mindmapping, electronic organizers **Hardware**: Hand-held computers
 Hearing & Vision	Assistive technologies for visually and hearing impaired students may either increase the signal or replace it with something else.	**Software**: Screen magnifier, screen color contrast, screen reader, captioning, computer-aided note taking **Hardware**: Braille/tactile labels, alternative keyboard with enlarged keys, Braille keyboard and note taker, signaling device, phone amplifier, personal amplification system/hearing aid, FM or loop system

Figure 11.3 Assistive technologies

STRUCTURING YOUR CONTENT

Before you begin to write a single line of HTML or even start writing your course content, you should think about how your course is going to be structured. Will you have a lot of material to read, or just a little? Will there be many pages or subpages?

The easier you can make it for students to find and read your course material, the easier it will be for them to learn.

MENUS AND NAVIGATION

The way you plan your site's navigation will affect your site's usability for your entire audience. A good approach is to write down the different categories that apply to each of your pages, and then group the pages into these categories. The key is to find an intuitive balance between overwhelming the user with too many options, and burying important information too deep in the site.

For example, if your site is made up of these pages, you are running the risk of creating a very cluttered and busy navigation:

- Course Content
- Guidelines
- Syllabus
- Schedule
- Messageboard
- Chat
- Mail
- Submit Assignments
- Assignment #1
- Assignment #2
- Assignment #3
- Assignment #4
- Grading
- Help

You could try grouping your pages into these categories, and create subcategories within this structure:

- About the Course—clicking reveals Guidelines, Syllabus, Schedule
- Course Content
- Assignments—clicking reveals Assignments #1–4, Grading, Submit Assignments
- Communicate—clicking reveals Messageboard, Chat, Mail
- Help

Now your students only have to sort through five links instead of fourteen.

Use common sense when defining categories—there may be some links that a student might use several times a day, so you might want them to sit on the top level for quick and easy access. Be careful when making exceptions to your rules, though—if you do this too many times, everything becomes an exception, and you have got a cluttered site again!

When you are designing your site, and choosing where to place your navigation, keep these questions in mind:

- Are the links grouped together in one place, where they can be easily found?
- Are there so many links on the page that it becomes confusing?

WRITING FOR THE WEB

Typically, users viewing websites do not read text as thoroughly as they do when reading printed text. Monitors have a lower resolution than printed material, which makes it less comfortable to stare at for long periods of time. Most online readers develop the habit of skimming the screen looking for key points rather than studying in detail. If it is necessary to read lengthy, wordy passages or papers, many users will print out the information to read it in comfort offline.

You can make it easier for readers to find what they need by:

- Keeping your **paragraphs short**—one idea per paragraph
- Using **headers** to announce and reinforce new themes
- Using **bulleted lists** to group ideas into a simple, easy-to-read format

WRITING FOR LEARNING-DISABLED STUDENTS

Being learning disabled doesn't mean a student can't learn—it may just mean that traditional learning methods are particularly difficult for that individual. Some students with difficulty reading may learn the same material just as well upon hearing it, or after seeing a graphic that explains the concept. For this reason, it can be helpful to explain key ideas in multiple different ways: text *and* a graphic or video that reinforces what is being taught.

The same principle applies to how you ask your students to express their understanding. For many students, the choice of whether to write a paper or give an oral presentation can make a huge difference in their ability to communicate what they have learned.

One of the biggest difficulties encountered by learning-disabled students is in interpreting academic demands and expectations. This can often be addressed by building checkpoints into assignments, such as "Submit a plan describing how you will approach this project." This allows the instructor to assess whether the student has understood what is expected of them, before the student has invested too much time into a project that may be on the wrong track.

Clear, explicit instructions are of course vital, but they alone are not the solution—the student must actively engage and interpret the tasks and requirements themselves.

ADDITIONAL CONSIDERATIONS

Some students with disabilities may require additional time to complete tasks such as self-tests and quizzes. A student using an alternative keyboard may not be able to type as fast as his classmates. Extend the allotted time for that student, or remove the time requirement.

Chat rooms are often inaccessible to users reading screen readers. Make sure that chat room participation is not a course requirement, or make arrangements for a disabled student to participate using other means such as a discussion room.

USING CORRECT CODE: XHTML AND CSS

HTML (Hypertext Markup Language) is the code used to describe web pages so they can be rendered in a browser. When HTML was created many years ago, no one could have predicted the sorts of dynamic, interactive pages that they would eventually be used to create. While HTML was easy to learn and fairly flexible, it had some significant limitations: for example, objects could not be placed anywhere on a page, but had to flow in a linear fashion, one item before the next. Creative designers found ways around these limitations: the TABLE tag was manipulated to allow precise placement of text and graphics.

But these clever fixes came with their own set of problems. Redesigning a website meant rewriting and rebuilding every single page of HTML on the site. Visually simple designs often required complex, bloated HTML. If code was written inaccurately, the web browser had to interpret the code as well as it could, slowing down the rendering of the page.

Tip

- Intermediate users: We recommend using Macromedia Dreamweaver to assist you in writing accessible code.
- Novice users: If you're not comfortable writing HTML code at all, we suggest Course Genie, a package from Horizon Wimba, which allows you to convert a Word document into a well-coded, accessible website that can be uploaded to WebCT.

To address these issues, HTML was given a fresh start by rewriting it using another language—XML, or eXtensible Markup Language. The result is called **XHTML**. Superficially, XHTML is not terribly different from HTML: the syntax is stricter, and some tags and attributes have been removed, but much of it is the same. The key is in the "extensible". XHTML essentially lets you ***define new classes of objects.***

What does this mean? Suppose you need all news-related images (but no others!) to be surrounded by a five-pixel blue border. Using old-style HTML, you would do this by wrapping every news image in a table tag.

```
<table border="5" bordercolor="blue">
    <tr>
        <td>
            <img src="images/news.jpg" width="200" height="100"
            alt="Top story: man bites dog">
        </td>
    </tr>
</table>
```

Every single image that needs a border would have to be treated this way.

Using XHTML saves you time and space. First define a class called "news" as having a five-pixel blue border.

```
.news {
    border: 5px solid blue;
}
```

Then add an attribute to any image tag that needs to be in class "news".

```
<img src="images/news.jpg" width="200" height="100" alt="Top
story: man bites dog" class="news" />
```

How does this work? The classes are defined within Cascading Stylesheets (CSS)—stylesheets, because they define the style of a page; cascading, because you can apply multiple stylesheets. You can define any style once and apply it throughout your entire site.

Tip
A site that may help you visualize this process is CSS Zen Garden (http://www.csszengarden.com). Every design on the site uses the same XHTML code to define the different areas of the page. By swapping out only the stylesheet, the appearance of the site changes dramatically.

So with a single CSS file, you can now define the look and feel of an entire website consisting of hundreds of pages.

WHY CAN'T I DO THINGS THE OLD WAY?

Feel free to skip this section if you are new to building web pages or are already familiar with XHTML and CSS.

TABLES AREN'T MEANT FOR LAYOUT

If you ever built a website before CSS became widely accepted, chances are you built it using tables. You probably took a large image and chopped it up in an image editing program, then placed each chunk of the image into a borderless table to lay it out exactly where you wanted.

The first reason to avoid tables is that it'll make redesigning your site much easier in the future. You won't have to chop up new designs and recreate every page of your site any more—you can do it all with one change of your CSS sheet and maybe a few changes to the HTML.

But the main reason is that it simply isn't all that accessible. Screen readers approach tables in a linear fashion; that is, they read out each column, left to right, and each row, top to bottom. If your table-based layout doesn't correspond to this model, blind users may not receive the information in the order you intended it. They may hear the menu read out in pieces, in between parts of your main content, and as you can imagine, it isvery confusing to navigate a page like this.

MANY OLD TAGS HAVE BEEN DEPRECATED

XHTML no longer contains several tags that address the appearance of a site. The FONT tag, which used to be the only way to set the font appearance on a page, has been removed from HTML. This is because fonts can be much more efficiently defined and updated using CSS. Similarly, the CENTER tag has gone away, to be replaced by CSS formatting.

Tip
There are many excellent resources, both online and offline, for learning XHTML and CSS. Here are some tutorials to get you started:

- Introduction to CSS
  http://www.w3schools.com/css
- Introduction to XHTML
  http://www.w3schools.com/xhtml

ACCESSIBILITY IN XHTML

For the rest of this section, we will use XHTML and HTML interchangeably; the basic principles are the same, and most of the differences are in the accuracy and consistency of the code.

Text

Text makes the World Wide Web go 'round. The greatest amount of content on the Web is basic, plain text. Text is the most accessible media format there is—it is easy for all browsers and screen readers to handle.

There is one big thing you need to be most careful of, and that is the **visibility of your text**. Aging users, people with poor vision, or even people using a small monitor may not see your site's text with the same clarity that you do. They may need to enlarge the size of the text to be able to read it better.

There are a few ways to do this. A **screen magnifier**, such as ZoomText, will make a screen behave much as if a giant magnifying glass has been placed between the screen and the user. An even simpler way is to use the text size settings in the browser to increase the font size on the page.

When you define the appearance of your text in CSS, you have a choice between absolute or relative font sizes.

- **Absolute font sizes** (pixels, points) should appear at the exact same size in every browser and every configuration. Text that is set to "12px" will appear as 12 pixels high. Designers often prefer absolute font sizes because they have greater control over the appearance of the text, and can dictate how much space a given block of text will occupy.
- **Relative font sizes** (percentages, "em") appear at a size relative to the user's font settings. Text that is set to "90%" will appear at 90 percent of the current text size. If the user changes their font size to "larger", the size of the text on the page will increase.

What is the implication here? **Use relative font sizes at all times.** Some browsers will allow absolute font sizes to scale up with the user settings, but not all. Your eyesight may be much better than that of some of your users, and what looks fine to you might cause problems for someone else. Make sure you give *them* the control of their screen.

EXAMPLE

```
body, p {
    font-family: Arial, Helvetica, sans-serif;
    font-size: 0.9em;
    color: #333333;
}
```

This will make the text for a page 0.9 em, or 90 percent, of its default size.

Be careful with the **contrast and colours** of your text. Whether your text is light on a dark background or dark on a light background, you need to make sure there is enough contrast between the text and the background for users with weaker vision to distinguish clearly. Additionally, if any information is conveyed by colour alone, reinforce the information with another method. In the example shown in Figure 11.4, the required fields are marked not only by a change in colour, but by bold text and an asterisk.

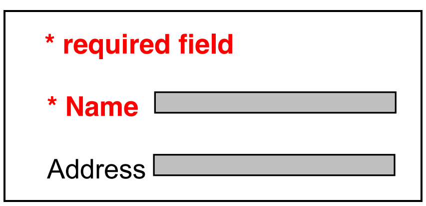


Figure 11.4

IMAGES

Alt text

There is a very simple, built-in way to make sure your images are accessible: use **ALT text**. Figure 11.5 would be coded as follows:

```
<img src="images/horse.jpg" width="240" height="180" alt="Racehorse warming up at track" />
```

When a screen reader encounters an alt attribute, it substitutes the text for the image, reading the text out loud. In order to make this as useful as possible for your users, you should choose text that is appropriately descriptive of the image. Include any details that are necessary to make the image make sense; don't bother with trivial descriptions if they don't add useful information.

Figure 11.5

Empty descriptions

There are some cases where an image does not require a description at all, or where a description would clutter the audio reading of the page.

Spacer (or transparent) images are typically 1x1 transparent images that are used to control the layout of a table-based website by pushing elements of the site into place. If your site is entirely CSS-based, you won't really need these. If you are working on an older site, though, you may still be using them.

Decorative bullet graphics are often used in lists to illustrate a point.

Figure 11.6 Decorative bullet graphics

Figure 11.6 shows three decorative bullets, which many people would mistakenly code as follows:

```
<img src="bullet.gif" width="5" height="5" alt="Red bullet" />
Marketing plan<br />
<img src="bullet.gif" width="5" height="5" alt="Blue bullet" />
Promotion plan<br />
<img src="bullet.gif" width="5" height="5" alt="Yellow bullet" />
Licensing plan<br />
```

With code like this, a screen reader user will hear: "red bullet marketing plan blue bullet promotion plan yellow bullet licensing plan".

Even though you don't want screen readers to attempt to describe these images, you still need to define their alt text, or the screen reader will read out the filename instead. The alt text on a spacer image or a decorative graphic should be empty, i.e., alt=" ".

Tip
Visually impaired users aren't the only ones to benefit from ALT text—you will too! By describing your images, you'll make it easier for search engines such as Google to index your content, and it'll be easier for other users to find the content on your site.

Long descriptions

Alt text is good for a short sentence, but sometimes a complicated diagram or graph cannot be thoroughly described in one line of text. When this happens, use the ALT attribute for a quick summary, and the **LONGDESC** attribute:

```
<img src="images/chart1.jpg" width="350" height="150" alt="Increase in readership over past 5 years" longdesc="chart1.html" />
```

The longdesc attribute is the URL for another web page, which should contain a complete description of the image in question.

Imagemaps

Imagemaps are just as easy to make accessible: add the alt text to the AREA tag for each clickable area within the map.

LINKS

We have already talked about menus and navigation and the importance of thinking about links. Here are a few additional considerations:

- **Link size**: If the images are graphic links, are they big enough so that users can easily click on them, even if they have poor motor control in their hands?
- **Descriptive link text:** If your link text is taken out of context, will it make sense? Many screen readers allow the user to pop up a list of *only* the links from the page. This is a useful way for a blind reader to navigate—unless your link text says "Click here"! Make sure your link includes enough text to clearly define the link, such as "Click here for the full schedule" or even "Full schedule".
- **Unique link names**: Similarly, if your link text is taken out of context, will a user see the same link text multiple times? Ten links that all say "Click here", but point to different pages, would be frustrating.
- **Link separators:** Link in a menu should be separated by more than just whitespace, for visually impaired users to better distinguish links from each other. Additionally, some older screen readers incorrectly read adjacent links as the same link.

Tip
On the Web, links are usually <u>underlined</u>. Most web users are accustomed to clicking on underlined links. To this end, it is best not to underline anything that is *not* a link unless conventional style requires it.

```
<a href="about.html">About</a> <a href="bio.html">Bio</a> <a href="contact.html">Contact</a>
```

This can be done by using a separator:

```
<a href="about.html">About</a> | <a href="bio.html">Bio</a> | <a href="contact.html">Contact</a>
```

Another alternative is to make each link into an item in an unordered list, and then use CSS to style the links. A screenreader will pause between list items, making the links more "listenable".

To do this, you will need this CSS:

```
ul {
    list-style: none;
}
ul li {
    display: inline;
    padding-right: 10px;
}
```

and this HTML:

```
<ul>
    <li><a href="about.html">About</a></li>
    <li><a href="bio.html">Bio</a></li>
    <li><a href="contact.html">Contact</a></li>
</ul>
```

Setting list-style to "none" will remove the bullets that are displayed by default before each list item, and setting display to "inline" will place all the list items on the same line. You can continue to style the list items with margin and padding settings as needed.

THE TITLE ATTRIBUTE

Similar to ALT text for images, the TITLE attribute can be used to make a link URL clearer. A person using a screen reader can set an option to read TITLE texts out loud instead of the link text. Most browsers display the TITLE text as a "tooltip", or small popup, that appears for a few seconds when the link is moused over.

The TITLE attribute can actually be validly applied to most HTML elements, but is best supported in the A (hyperlink) tag.

JAVASCRIPT AND DHTML

Many people are fond of "drop-down" or rollout menus, which appear when the user moves the cursor over a top-level category. For many users, they are a quick way to jump straight to the page they need.

Many of these menus create accessibility issues. Some are very sensitive to mouse movement and will "roll up" the instant the mouse drifts outside the box—which can be a serious problem for users whose hands cannot control the mouse precisely. In addition, some of the **Javascript** and **Dynamic HTML** (DHTML) code needed to generate these menus is not understood by screen readers, and will be ignored. This can prevent many users from using the menus at all!

This doesn't mean you can't use Javascript or DHTML, but if you are using it for important functions like navigation, be sure that you have a fallback plan for browsers without Javascript. You can usually test this yourself by turning Javascript off in your browser.

POPUP WINDOWS

Popup windows have their purposes:

- displaying extra information without making the user lose their place on the page
- letting the user open a link to another site that they can look at later
- advertising (often unwelcome)

Consider what happens when a screen reader encounters a new window. It will first announce that the new window has opened, and then shift focus to that window, reading out the new content. A blind user cannot quickly glance at the new window and put it aside for later; they must hear the content, decide whether or not it is relevant, and choose which window to continue reading.

Unexpected popups can also be a problem for users with learning disabilities, as the sudden appearance of a new window can be distracting and make them lose their place on the previous page.

As a general rule, warn the user if a link will open a new pop-up window. Additionally, consider whether the pop-up window is absolutely necessary. Traditionally, links to external sites were opened in new browser windows. This is preferred by many, but it is better to let the user choose: nearly all browsers let you right-click (or Control-click, if you are a Mac user) a link to open it in a new window.

DATA TABLES

We have established that you shouldn't use tables for graphic layout, but that doesn't mean you can't use tables at all. Tables are indispensable for their original intended purpose: displaying tabular data in an organized and legible format.

Sighted users can easily glance at a data table, see where the row and column headers are, and find the piece of data they are seeking. But when a screen reader encounters a table, it reads it out in a linear fashion: row by row, each cell in order. If the table is very large, it is easy to lose track of which column you are listening to. And if the table is very complex, with merged cells that overlap multiple rows or columns, it may not make much sense when read out loud.

Figure 11.7 gives an example.

Schedule Results

099 Schedule

	Stop #2112 WESTBOUND E BROADWAY AT COMMERCIAL DR BAY1	Stop #924 WESTBOUND E BROADWAY AT CLARK DR	Stop #9052 WESTBOUND E BROADWAY AT MAIN ST	Stop #9053 WESTBOUND W BROADWAY AT CAMBIE ST	Stop #9054 WESTBOUND W BROADWAY AT WILLOW ST
	9:10a	9:11a	9:15a	9:17a	9:19a
	-	-	9:16a	9:18a	9:20a
	9:12a	9:13a	9:17a	9:19a	9:21a
	9:14a	9:15a	9:19a	9:21a	9:23a
	9:16a	9:17a	9:21a	9:23a	9:25a
	9:20a	9:21a	9:25a	9:27a	9:29a
	9:22a	9:23a	9:27a	9:29a	9:31a
	9:24a	9:25a	9:29a	9:31a	9:33a
	-	-	9:32a	9:34a	9:36a
	9:28a	9:29a	9:33a	9:35a	9:37a

Figure 11.7 A table with a bus schedule

TABLE HEADERS

Every table should have clearly labelled table headers. Often developers have done this just by colouring the background of the header cells or making the text bold, but as we know, this visual information will be lost when run through a screen reader.

So how can we tell the browser itself where the table headers are? This can be done with the <th> tag, which works exactly like the <td> tag except it makes the distinction that the cell is a header. Plus, you can still style the <th> tag using CSS to make the headers look however you want.

CAPTION AND SUMMARY

The <caption> attribute gives all users a quick definition of the table. The <summary> attribute provides more detail for screen readers.

```
<table summary="The schedule for the westbound 99 B-Line, with stops
at Commercial, Clark, Main, Cambie, Willow, Granville, Macdonald, Alma,
Sasamat, and UBC.">
<caption>Schedule for the 99 B-Line</caption>
<thead>
<tr>
<th> …
```

SCOPE

The <scope> attribute goes into a table header to tell the browser which header is associated with a given row or column. This helps remove ambiguity and allows the screen reader to provide the user more information about the given table. Two of the options are scope="row" or scope="col".

Table 11.2. Student graduation data

	Graduation year	GPA
Bob Smith	2002	3.4
Sara Miller	2004	3.8

This would be written as follows:

```
<table summary="Graduation year and GPA for each student enrolled in
the program.">
    <caption>Table 1: Student graduation data</caption>
    <tr>
    <td></td>
        <th scope="col">Graduation year</th>
        <th scope="col">GPA</th>
    </tr>
    <tr>
    <th scope="row">Bob Smith</th>
        <td>2002</td>
        <td>3.4</td>
    </tr>
    <tr>
    <th scope="row">Sara Miller</th>
        <td>2004</td>
        <td>3.8</td>
    </tr>
</table>
```

COMPLEX TABLES

Tables with multiple layers of headers and categories can become quite complicated. XHTML does allow for further description of complex tables, including grouping sets of rows and associating cells with headings. These ideas may be of interest if you have many data tables. Here are some resources for complex tables:

- http://www.usability.com.au/resources/tables.cfm
- http://jimthatcher.com/webcourse9.htm.

ACCESSIBILITY FEATURES

Most of the changes we have talked about will improve your site's accessibility without changing its functionality in any way. Now we are going to discuss a few things you can add to your site that will be of extra benefit to disabled users.

SKIP TO CONTENT

While many experienced screen reader users listen to websites at very high speeds, there is still no audio equivalent to skimming the page. Sighted users can easily ignore any part of a website that is of no interest to them, or something they have seen before, such as the navigation.

One feature that will improve your website's usability is a **skip to content** option. This is a link, coded to appear invisible to sighted users, that screen reader users can click to skip any navigation menus that they have already encountered and don't need right now.

There are three steps to creating a skip navigation option.

(1) Add an anchor link just before your main content starts:

```
<a name="maincontent"></a>
```

(2) Add a new class in your CSS:

```
.skiplink {display:none}
```

Now, anything that you assign to class "skiplink" will not be displayed in the browser.

(3) Add this link right after the <body> declaration of your page:

```
<a class="skiplink" href="#startcontent">Skip over navigation</a>
```

KEYBOARD SHORTCUTS

The accesskey attribute allows you to predefine keyboard shortcuts to specific pages or form fields on your website. This is especially beneficial to anyone who navigates your site using only a keyboard, or whose use of a mouse is limited. Accesskeys are triggered by the user holding down ALT and pressing the specified key.

Simply define the key within an existing link to that page:

```
<a href="about.html" accesskey="1">About This Site</a>
```

Be careful not to override existing browser keyboard shortcuts that appear in the browser toolbar, such as F (File), E (Edit), V (View). To be certain, use only numbers as access keys; you are less likely to conflict with existing shortcut definitions. There is no automatic listing of what access keys are defined on a site, so you will have to list the keys that you have defined either on a separate page of your site or next to the appropriate links.

There are a few conventional shortcuts:

- ALT-1: Home page
- ALT-2: Skip to main content
- ALT-9: Feedback

Not all browsers support accesskey yet, but those that don't will simply ignore the attribute.

Multimedia

We use the term "multimedia" to refer to audio, video, PDF and Flash: any content on the Web that is not text, HTML, or a graphic.

Tip
Different people have different learning styles; every time you present your content in a different medium, you *increase* the accessibility of your site. Developing accessible sites does not mean making every type of media usable, it means making all the *information* available to everyone.

Multimedia can create some of the richest and most engaging experiences on the Web. For this very reason, it is also the most challenging aspect of web accessibility. The simplest rule to follow for rich media is: *provide an alternative.*

AUDIO

For audio, the accessibility alternative may be relatively simple; if the audio file in question is spoken word, it is sufficient to provide a text transcript. For music, provide lyrics and, if appropriate, a description of the piece and an explanation of its significance.

Audio can be used to benefit learning-disabled users. Consider offering a reading of key passages or especially difficult text. In returning to our original point that improvements made with accessibility in mind will help non-disabled users as well, consider how an audio reading will assist someone who is not fluent in the language. There are parts of language that are not well conveyed by text, such as correct pronunciation, and language flow.

VIDEO

Video files are a great way to present information. These can be short video clips that you create yourself, or links to web-based videos that a peer has made. A Chemistry professor at San Francisco State University has created a captioned video showing each step of his lab experiments. He reports fewer questions about the procedures and positive feedback from students. If you use a video file that has no audio track, let your students know that there is no audio right in the link to the file (e.g., "Video of amoeba movement via temporary projections called pseudopods—no audio"). That way the students will know that they do not need speakers and deaf and hard of hearing students will know that they do not need captions.

When adding video to your site, accommodations need to be made for both vision and hearing-impaired users. For visually impaired users, **audio description** (AD) of the contents of a scene is important. In twenty-five words or less, an audio description is a narrator providing a spoken context for anything that the viewer cannot understand by listening to the soundtrack. For hearing impaired users, any key information provided in the video should be represented in the text equivalent. Perhaps in the picture there is a sign placed prominently that the viewer is expected to read, or people in the video are reacting to a sound heard off-camera. These details affect the viewer's understanding of the material, and you need to ensure that all visitors to your site are able to get this information.

TRANSCRIPTS VS. CAPTIONS/SUBTITLES

A transcript is one way that you can provide your audience with a second format for your content. Transcripts are easy, and can be created by anyone. If you are the creator of the video, chances are you have a script that you can provide. In some cases, a script may not need any modifications to be a full transcript. If you need to write a transcript from scratch, it isn't hard, but it is time-consuming. Load up the video, and your word processor and get typing. Before long you will have a transcript to publish.

A transcript usually consists of one file with the whole content of the video. On the other hand, captions and subtitles are synchronized with the video stream, and as such require more effort, and time to create.

Tip

You may want to consider using speech recognition software such as Dragon NaturallySpeaking. The authors of this chapter have had very good results with NaturallySpeaking. One of the big advantages of using speech recognition is that it keeps your hands free to do other things while transcribing, such as control the playback rate, and replay a section of the video). In some cases, you will find that transcription using speech recognition can actually be faster than manual input via the keyboard!

CAPTIONING VS. SUBTITLING

Subtitles are a textual representation of the speech in a video clip. The focus of subtitles is to state what is said, not what is audible. Subtitling does not attempt to provide information about other aural cues, such as a ringing doorbell.

Tip

If you wish to show a clip, which has dialogue in another language, consider captioning in your audience's primary language! By doing this, you can aid language comprehension, for students that understand some of the primary language. For students that don't speak the clip's primary language, they will now be able to understand what is said in the video.

Captions attempt to provide a textual representation of all the audio in a video clip. This may include speech as well as sound effects (for example, a ringing doorbell) and background music. Writing video captions can come down to a matter of style. As with everything else in accessibility, you need to use common sense when making decisions about how much has to be captioned. Be thorough without overwhelming the user with unnecessary details.

If you are looking to provide a base level of enhancement, start with a transcript of the video. For a more interactive approach, subtitling or captioning can greatly increase the video's comprehensibility for people who struggle with the language spoken. Reading the text while hearing the dialogue can be very helpful when learning a language.

Tip

Open vs Closed Captioning: Closed captioning is a technology that an individual user enables, to see the captioning for a given video. Common applications of this are in: News broadcasting, and on VHS/DVD movies. With open captioning, the video's picture has the textual representation directly ingrained into it. Users cannot choose whether they see the captions or not; they are always enabled. A common application of open captioning is for videos in another language.

Captioning is something that you can do yourself, but due to the amount of time necessary it may be more practical to hire a professional captioning company to caption your video. This can be expensive, but in the end you may find the price worthwhile. Video alternatives should be considered part of the cost of building and maintaining your site.

FLASH

Tip

Caution: Avoid building your entire website in Flash. Yes, you can make some visually impressive pages doing so. Yes, Flash sites can have a certain cool-factor, unachievable with HTML. It simply remains that most Flash sites are not as accessible as HTML sites.

Like all other forms of multimedia, Flash can improve accessibility for some users and degrade it for others. It can be easier to demonstrate concepts with interactivity and animation than with text and images. A well-designed Flash demonstration can have enormous benefits for students, especially those with learning disabilities. Yet it can be a problem for users with visual or physical handicaps. Some problem areas include:

- representing information only as graphics—see the discussion regarding images without alternative text
- small buttons, or buttons that cannot be navigated to using the keyboard—users with physical disabilities may have trouble using the interface

FLASH AND SCREEN READERS

Since Flash generally does not present text in a linear fashion, often screen readers cannot synthesize speech in a manner that makes sense to the user. Blocks of text can change over time, be randomized, and appear at differing locations of the screen. Users must also have an up-to-date screen reader that works with the current version of Flash.

When creating content in Flash for screen readers, keep the following questions in mind:

- Does the reading order make sense? Flash objects are read in the order in which they were created, rather than the order in which they appear visually on the screen.
- When an event occurs on the screen, does the screen reader start reading again from the start? You don't want to bombard the user with repeated information (recall the discussion on navigation in the XHTML/CSS section above).
- Do you *need* to display your content in Flash, or will a standard web page do just as nicely?

Note: This doesn't mean you should *never* use Flash. It means that if your entire site consists of three buttons and a block of text, Flash is probably overkill. If you want some special animations, consider making them in a JavaScript-enabled HTML web page. A screen reader will ignore the animations but can read any text-based information.

Adobe offers suggestions and best practices for accessibility in Flash and other products on their website at http://www.adobe.com/accessibility/.

PORTABLE DOCUMENT FORMAT (PDF)

The primary challenge of PDF files is to make sure that the text of your document is encoded as text, not as a graphic. If you scan a document onto your computer and directly output it to a PDF file, the contents of the file will be encoded graphically. If you want to create a PDF file from a text document you have scanned, be sure to use Optical Character Recognition (OCR) software. OCR software converts graphical lettering to text. PDF viewers (such as Adobe Reader) cannot analyze graphics for text, so this must be done when creating the PDF file.

The PDF format is used frequently online, but often unnecessarily. In many cases it is used to avoid creating a web page, or to ensure that the layout of the information is exactly as the designer wants it. In these cases, the information could be better conveyed in simple HTML, without forcing the user to download and view an extra file.

Of course, there are valid reasons to use the PDF format, which we will consider here.

Footnoting

HTML does not provide support for footnoting, or referencing. If you only need to cite one reference, including that information at the bottom of the web page may be sufficient. But if you are working on a document that requires extensive footnoting, the PDF format may be a better solution.

Annotating forms

If you require that other people fill out and return a form online, the PDF format has some extra features that may be useful. However, you should consider whether a web form with submission would accomplish your task.

Printing

The PDF format makes considerations for documents that are designed for reading on paper. HTML doesn't, as it was designed to be a web/online format. As a result, HTML has no concept of print margins, page sizes, etc. Even the most savvy web designers will tell you that multi-column web pages can be quirky at the best of times.

Uneditable content

For official documents, journal articles and copyright-sensitive materials, PDF is often preferred as the end user is unable to make any edits or changes to the document.

There is a difference between *wanting* and *needing* to format your document using multiple columns. If you just want to use multiple columns, but it is not crucial to the information in the document, go brush up on your XHTML/CSS skills, and stay away from PDF. However, there are situations where the columnar layout and print format of the document is crucial, and in these cases usage of the PDF format is fine (e.g., academic articles, order forms).

Specialized notation

If you need to share a document with some specific notation (e.g., mathematics or another language), there are some specific technologies you should consider before jumping to PDF.

In the case of mathematics, if you are working on a file with fairly standard math notation in it, you may not need to use PDF: MathML might be enough. MathML is a specialized markup language developed by the W3C for displaying mathematics. The downside of MathML, is that your target audience must install the MathML fonts on their computer.

In the case of other languages, the Unicode character-encoding format may provide the characters you need. Fortunately, modern operating systems (Windows XP, Mac OS X) have support for Unicode built in.

If you need to display some other notation, PDF is probably a suitable choice, since it has roots as a graphical file format. The primary advantage of these other technologies is that the user does not have to launch a different piece of software to view your document. MathML and Unicode can be drawn natively in your audience's web browser.

PDF and screen readers

Adobe Acrobat has been able to function as a screen reader since version 6. So for the purposes of testing your PDF files, checking what Acrobat says (literally) is the first point to test.

Tagging PDF files

Tags are extra information about the content of a document. Tags allow the document creator to specify alternative text of images, and to denote specific pieces of text as headings. Tags are similar to attributes in HTML—they provide extra information about an item in the document.

Quick Tip!
Google for the URL of your PDF files. The HTML output that Google outputs is usually a fairly good indication of the accessibility of your PDF files. You should also try using the search function in your PDF viewer. If the search function works, chances are good that a screen reader will be able to interpret the text of the document. As with all other methods of validation, use it to check for technical problems only, then rethink the problem areas.

Adding tags in Microsoft Word (2000 or newer)
To add alternative text to a graphic:
(1) Right click on your image.
(2) Format picture.
(3) Go to the Web tab.
(4) Type your text under "Alternative Text".

Specifying headings is also easy; just use the Word text style for headings. The added benefit for you, the document maintainer, is that now should you want to change the formatting of headers, you only have to change the formatting once. Using Word's styles is akin to using Cascading Style Sheets (CSS) to format HTML pages.

When you are working on a document that requires multiple column formatting, use Word's column function. Acrobat will automatically recognize the columnar arrangement, and correctly generate the reading order for software such as screen readers.

Full procedures for tagging are beyond the scope of this manual. For more information, Adobe provides a how-to guide on creating accessible PDF files (both from your initial source, and retrofitting) on their website (http://www.adobe.com/enterprise/accessibility/pdfs/acro7_pg_ue.pdf).

As with many other forms of accessibility, spending the time to increase the ease of use for disabled people improves the accessibility for other users as well. By adding tags to your PDF documents, now your documents are viewable on other devices, such as personal digital assistants (PDAs). Joe Clark wrote a very solid article on PDF accessibility, which discusses the appropriate usage of PDF files (at http://www.alistapart.com/articles/pdf_accessibility/).

Testing your site

ACCESSIBILITY CHECKERS AND THE HUMAN FACTOR

There are some useful tools available for testing the accessibility of your site. They will examine your code and look for items like missing alternative (ALT) text or table headers, and make recommendations on improvements that will help your site meet each priority level. Accessibility checkers, such as Watchfire WebXact or UsableNet LIFT Machine, can be an invaluable help in identifying accessibility gaps in your web pages. Products or application plug-ins, such as UsableNet LIFT for Dreamweaver, allow you to check the accessibility before you even post the final page to the Web. You may notice that they will also issue a list of warnings, regardless of your website's actual accessibility results. Why is this?

There are simply too many accessibility standards that only humans can test. No software can tell you if your site's menu navigation is intuitive, or if the ALT text you have included is sufficient to describe the image. Use an accessibility checker *first* to make sure you have covered everything you can, and then work through the warnings it provides, looking at your site critically.

Tip
XHTML/CSS Validators—If you are building your site from scratch as described in Chapter 13, Planning Your Online Course, you should test the validity of your code using an XHTML and CSS validator. This will help ensure that your site works well with all browsers, including screen readers.

- XHTML: http://validator.w3.org/
- CSS: http://jigsaw.w3.org/css-validator/

The best way to test your site for accessibility is to ask a user with disabilities to try it. Only a human, examining both the context and the content of a page, can fully assess your site's accessibility. It is hard, as a sighted user, to imagine navigating a website only by voice; as a user with full mobility, it is hard to imagine the frustration of trying to click on a link that is too small. If you truly want to know if your site is accessible, bring it to the people who experience the problems you are trying to address.

EVALUATION CHART

We have included a checklist of the most common and significant accessibility issues that you should look for when evaluating your site. Some of these guidelines can be tested using an accessibility checker as mentioned above; others you will have to look at objectively and decide for yourself whether they are adequately met.

You can use this chart to evaluate an existing website before making accessibility changes, or to see how well you have done after "accessifying" your existing site or building a new one.

Table 11.3. Accessibility evaluation chart

Category	Description	Vision (V) Hearing (H) Motor (M) Cognitive (C)	Notes	Rating (1–5)*
Structure & appearance	Navigation links and placement consistent on each page.	M,C		
	Text good contrast to the background	V,C		
	Each page has a unique descriptive title	V,C		
	Valid XHTML/CSS used throughout the site	V,M,C		
Images	All images have ALT text that either clearly describes the image, or in the case of decorative images, contains a space (alt=" ") to prevent the screen reader from describing the image.	V		
	Images that cannot be adequately described in ALT text (charts, graphs) are further described on a LONGDESC page.	V		
	Links in imagemaps also have ALT text	V		

Category	Description	Vision (V) Hearing (H) Motor (M) Cognitive (C)	Notes	Rating (1–5)*
Text & links	Fonts use a relative font size (em, %), not absolute (px, pt)	V,M,C		
	Heading tags (H1, H2) used correctly as headers, not to format font	V,M,C		
	Ability to skip navigation	V		
	Links separated by more than just whitespace	V		
	Colour not used to convey information, or reinforced by other visual cues	V		
	Underline not used on non-linked text	C		
	Link text does not repeat on the same page (e.g., “click here”) but is unique to each link.	V		
	TITLE attribute added to ambiguous links.	V		
	Lists use the UL/OL and LI tags, not bullet images	V,C		
	Coding should not prevent user from changing colours with own stylesheets	V,C		
Tables	Tables used for data, not for layout	V		
	Table row or column headers indicated using the TH tag.	V,C		
	Table summary provided	V,C		
Forms	Forms can be navigated in the correct order using the TAB key	V,M		
	Each form field has an associated LABEL tag	V		
	Enough time given to fill out forms	V,M,C		
	Required fields noted as such before the form label, and marked with asterisk or bold	V		
Multimedia	Transcripts available for all audio	H		
	Transcripts or captioning available for all video	V,H		
	Content presented in Flash described in an alternative format as well	V,H,C		
	Avoid distracting animations, scrolling text	V,C		
	Links provided to download any necessary plug-ins	V,H,M,C		
	PDFs accessible or plain text made available	V		
	Content in applets and plug-ins accessible or else not required	V,M,C		
	If alert sounds are used, reinforce the sound using visual notification	H		

Category	Description	Vision (V) Hearing (H) Motor (M) Cognitive (C)	Notes	Rating (1–5)*
Javascript	Site navigation still works with Javascript turned off.	V,C		
	Drop-down menus do not require difficult, precise mouse movement.	M, C		
General	Passes automated accessibility validator such as Watchfire WebXact	V,H,M,C		
	Site can be navigated by keyboard only	V,M		
	User notified if pop-up windows are to be used	V,M,C		
	External windows do not open pop-up windows	V,M,C		
	No autoplay of music, or ability to turn off music easily	V		
	If frames must be used, they are clearly titled	V		
	Page still usable with stylesheets turned off	V,C		
	Site includes search engine	V,M,C		
	Distracting animations avoided	V,C		
	Pages do not automatically refresh	V,M,C		
General Notes				

RATING SCALE

5 = Excellent. Meets or exceeds the relevant accessibility guideline.
4 = Good. Meets the guideline, but could be further improved for better accessibility.
3 = Incomplete. Some effort has been made to meet the guideline, but not all instances of this item have been addressed.
2 = Poor. Guideline has been inconsistently or incorrectly applied.
1 = **Failed**. Completely ignored or unimplemented.

Further design resources

During our research, we have collected a great number of online resources as guides and references. We hope that you will find them to be a valuable aid to your exploration of accessible course design.

Tip

- Accessibility is vital for educational materials.
- Accessibility aids usability for all.
- Making your site accessible isn't all that difficult, and can be done in stages.
- Redundant media is a good thing.

Fundamentals

These sites are good general starting points when studying accessibility.

- **W3C Web Accessibility Initiative (WAI)**
  http://www.w3.org/WAI/
  The Web Accessibility Initiative (WAI) works with organizations around the world to develop strategies, guidelines, and resources to help make the Web accessible to people with disabilities. They developed:
- **WCAG Guidelines 1.0**
  http://www.w3.org/TR/WAI-WEBCONTENT/
- **Accessify**
  http://www.accessify.com
  News & articles, tutorials, discussion forum.
- **Dive Into Accessibility**
  http://www.diveintoaccessibility.org
  Easy step-by-step guide to improving the accessibility of your site or blog.
- **Center for Applied Special Technology (CAST): Universal Design for Learning**
  http://cast.org/research/udl/index.html
  "Founded in 1984 as the Center for Applied Special Technology, CAST has earned international recognition for its development of innovative, technology-based educational resources and strategies based on the principles of Universal Design for Learning (UDL)."

Technical

Introductions to creating valid XHTML and CSS, and how to use it in the process of creating valid, accessible websites.

- **XHTML Tutorial**
  http://www.w3schools.com/xhtml/default.asp
- **CSS Tutorial**
  http://www.w3schools.com/css/default.asp
- **Zen Garden**
  http://www.csszengarden.com/
- **Creating Accessible Page Layouts**
  http://www.utoronto.ca/atrc/tutorials/actable/index.html
  How and why to avoid using tables for layout.
- **PDF Accessibility**
  http://www.alistapart.com/articles/pdf_accessibility
  Editorial about specific purposes for which you should use PDF files, and reasons why for everything else you should leave it alone.
- **Flash Accessibility**
  http://www.webaim.org/techniques/Flash/
  IMS Guidelines for Developing Accessible Learning Applications
- http://ncam.wgbh.org/salt/guidelines/
- http://www.macromedia.com/resources/accessibility/

Tools and validators

These handy assistants can be very useful for testing your site.

- **Watchfire WebXACT (previously known as Bobby)**
  http://webxact.watchfire.com/
  "WebXACT is a free online service that lets you test single pages of web content for quality, accessibility, and privacy issues."
- **CSS Validator**
  http://jigsaw.w3.org/css-validator/
- **XHTML Validator**
  http://validator.w3.org/
- **Vischeck**
  http://www.vischeck.com/vischeck/
  See what images and web pages look like to people with different types of colourblindness.
- **Lynx Viewer**
  http://www.yellowpipe.com/yis/tools/lynx/lynx_viewer.php
  See what your web page would look like in a text only web browser.

Other

- **Developing sites for users with cognitive/learning disabilities**
  http://juicystudio.com/article/cognitive-impairment.php
- **Richard Felder—Index of Learning Styles**
  http://www.ncsu.edu/felder-public/ILSpage.html
  "The Index of Learning Styles is an on-line instrument used to assess preferences on four dimensions (active/reflective, sensing/intuitive, visual/verbal, and sequential/global) of a learning style model formu-

lated by Richard M. Felder and Linda K. Silverman. The instrument was developed by Richard M. Felder and Barbara A. Soloman of North Carolina State University."

- **Biology Success! Teaching Diverse Learners**
  http://www.landmarkcollege.org/institute/grants%5Fresearch/biology%5Fsuccess/book.html
  "Biology Success! is an innovative project based at Landmark College in Putney, VT and funded by the National Science Foundation's Research in Disabilities Education program (HRD No. 0004264). Biology Success! asserts that students with learning differences can succeed in high school and college introductory biology courses when the curriculum has been designed to respond to their learning needs."

Summary

Web accessibility is especially critical in education to ensure that all students have fair and equivalent access to learning materials. Government institutions in the US and UK are required by law to make their web content accessible. Standards and practices for accessibility are agreed upon by the W3C and implemented by the WAI.

Sight, hearing, mobility, and learning disabilities can affect how your students access and interpret information on the Web. Assistive technologies can help with some of the difficulties faced; some must be addressed by your website itself. When making an accessible site, start by thinking about its design, structure, and content.

It is neither quick nor easy to create multiple pathways to reach learning objectives in the online environment. It will take time to build up a set of online materials, activities, and assessment strategies that accommodates the wide variety of learning needs of students with disabilities and learning preferences of all students. Your efforts will create an inclusive space for everyone, including students traditionally marginalized by their needs in the online environment.

As the old saying goes, "You cannot please all of the people, all of the time." In our case here, we are just trying to increase the probability that each student will succeed in our online course area, regardless of his or her disabilities, learning preferences, or life situation. We do this by increasing the number of methods by which students get and use the content. We do this, whenever possible, by giving options to students regarding how we will evaluate their performance. We do this by taking the time to engage students in different ways and at different levels. We do this by applying UDL principles to online teaching and learning.

Once you have taken UDL principles into consideration when developing your course materials, use correct XHTML and CSS—or a program that can generate this for you—to build or modify the site according to the guidelines provided by the WCAG. This will help to ensure that the technology does not create barriers for students with disabilities.

Glossary

accessibility: the practice of making web pages and other computer-based media accessible to all users, ensuring that those with disabilities have equivalent access as those without

ADA: Americans with Disabilities Act

alt text: alternative text, displayed in place of an image

assistive technology (or adaptive technology): software or hardware that enables people with disabilities to perform tasks that would be difficult or impossible with the assistance of technology

audio description: an additional narration track for the visually impaired, accompanying television and movies. A narrator describes the action in the scene during pauses in the audio.

caption: 1. on-screen description of all significant audio content in a video. 2. HTML attribute to describe a table, displayed with the table.

Cascading Style Sheets (CSS): code used to define the presentation of a document written in HTML or XHTML

CMS: content management system, used to more easily maintain pages on a website

deductive learners: students who prefer starting with more structure, deriving consequences and applications from the concepts and theories

Dynamic HTML (DHTML): a collection of technologies, such as HTML and Javascript, used to create interactive or animated websites.

headtracking: controlling the mouse pointer by use of head motion

headswitch: a button that can be activated with light pressure from the head or any body part that can be moved accurately and reliably

Hypertext Markup Language (HTML): a markup language used to create documents on the Web containing text, graphics, sound, video, and/or hyperlinks

inductive learners: students who prefer beginning with meaningful examples before extrapolating the main concepts or theories

intuitive learners: students who prefer reflective activities and resources that require imagination

JavaScript: a Web scripting language that can be used to create interactive content on a web page

learning disability: a psychological or neurological condition that affects a person's ability to communicate and/or learn effectively. Includes conditions such as dyslexia (reading difficulty), dysgraphia (writing difficulty), dyscalculia (difficulty with mathematics), and aphasia (problems comprehending language)

longdesc (long description): a separate HTML document containing the description of an image or media when the description is too long to be contained in the alternative text

Macromedia Flash: a multimedia authoring program used primarily for web content

Portable Document Format (PDF): a platform-independent file format developed by Adobe Systems

predictive typing: software that offers the user a choice of words at each point in a sentence, according to what words are statistically most likely to appear in a given context

screen reader: text-to-speech software that reads aloud what is being displayed on the screen

screen magnifier: software that displays an enlarged view of the current screen on a standard monitor

Section 508: an amendment to the Rehabilitation Act of 1973, which states that electronic and information technology developed or maintained by any agency or department of the United States Federal Government must be accessible to people with disabilities

sensory learners: students who prefer fact-based activities and resources.

sip/puff switch: a two-position switching device that can be activated by sipping or puffing and allows the user to control electronic devices

subtitles: on-screen translation of dialogue and on-screen text

tablet: an alternative pointing device where the user uses a stylus on a pointing surface, like a pen on paper

trackball: an alternative pointing device where the user rolls a ball in a holder

transcript: a textual version of audio- or video-based material, including speeches, conversations, television and movies

usability: the ease of interaction between a human and a computer interface

UDL: Universal Design for Learning

World Wide Web Consortium (W3C): a group that establishes specifications, guidelines, software and tools for various aspects of the Web, including file formats and scripting languages

WAI: Web Accessibility Initiative

WCAG: Web Content Accessibility Guidelines—developed by the W3C

XHTML: eXtensible Hypertext Markup Language

Appendix

The following is a short ten-point checklist which you can use to help guide your site towards better accessibility. This is not a complete list, but draws ideas from Priority 1 and Priority 2 checkpoints.

Examine each of the elements of your site as described in the chart. Decide for yourself how well they meet the criteria, then give each item a rating. Low rated elements should be revisited and improved in order for your site to be considered accessible.

Rating scale

5 = **Excellent.** Meets or exceeds the relevant accessibility guideline.

4 = **Good.** Meets the guideline, but could be further improved for better accessibility.

3 = **Incomplete.** Some effort has been made to meet the guideline, but not all instances of this item have been addressed.

2 = **Poor.** Guideline has been inconsistently or incorrectly applied.

1 = **Failed.** Completely ignored or unimplemented.

	Description	Rating details	Rating (1–5)	Notes
1	**Text alternatives** Text equivalent provided for every non-text element, including: images, graphical representations of text and symbols, imagemaps, animations, applets and programmatic objects, frames, scripts, graphical buttons, audio and video. *Assists:* Vision, Cognitive	5—Complete and correct alternative text provided for all elements. 3—Alternative text available for some but not all elements. 1—Alternative text is missing, incomplete, or incorrect.		
2	**Text** Fonts can be resized using the browser. Text is high-contrast. *Assists:* Vision, Cognitive	5—Text is easy to read and resize 3—Text can be resized, but may cause problems in layout when enlarged; some text may be hard to read 1—Text cannot be resized, and/or is hard to read due to size, colour or contrast		
3	**Links** Link text makes sense out of context and does not repeat *Assists:* Vision, Cognitive	5—Each link has clear and unique link text 3—Some link text repeats or is vague (e.g., "click here") 1—Links cannot be understood when taken out of context		
4	**Colour** All information conveyed with colour is also available without colour, for example from context or markup. *Assists:* Vision (colourblindness)	5—Colour used appropriately 3—Colour used to convey information, but the content has alternative explanation/description. (e.g., A pie-chart with the colour and the percentage). 1—Colour used to convey information (e.g., "click the red link")		
5	**Distraction** No screen flickering, refreshing or distracting animations. If pop-up windows must be used, user is notified in advance. *Assists:* Vision, Cognitive	5—No flickering or distractions 3—Some animations may be distracting 1—Unexpected pop-ups; screen is distracting and chaotic		
6	**Clarity & consistency** Clear and simple language used, as appropriate for site content. Navigation stays consistent across the site. *Assists:* Vision, Cognitive	5—Content is written at the appropriate level for site visitors. Site is easy to navigate. 3—Some content or menus may be confusing 1—Language too difficult for site visitors to understand; menus change from page to page		
7	**Data Tables** Row and column headers identified. For complex tables, data cells are associated with header cells. *Assists:* Vision, Cognitive	5—Headers complete and complex cells associated with headers 3—Incomplete or incorrect headers 1—No headers provided		
8	**Frames** If frames must be used, all frames clearly titled. *Assists:* Vision, Cognitive	5—Frames correctly titled 3—Some frames titled, or ambiguously titled 1—Frames used without titles		

	Description	Rating details	Rating (1–5)	Notes
9	**Plugins, applets & scripts** Pages are usable when scripts, applets, or other programmatic objects are turned off or not supported. *Assists:* Vision, Cognitive, Motion, Hearing	5—Turning off plugin/script leads to fallback alternative 3—Turning off plugin/script loses functionality, but site is still otherwise usable 1—Site cannot be used without plugin/script		
10	**"Last resort"** If, after best efforts, the material cannot be made accessible, a link is provided to an alternative, accessible page that has equivalent information (or functionality), and is updated as often as the inaccessible (original) page. *Assists:* Vision, Cognitive, Motion, Hearing	5—Original pages adequate, or alternative pages provided when necessary 3—Alternative page provided, but not equivalent 1—No alternative pages provided when needed, or alternative pages provided when original pages could be made accessible		

Table 11.4. Accessibility evaluation chart—detailed

Case studies

From 2005–2006, the University of British Columbia was involved in a BCcampus-funded project on web accessibility in online learning. During the project, we created a focus group of people with different disabilities. Based on their comments, modifications and redesigns were done on five courses that were piloted in summer 2006 as "accessible courses". Where possible, we asked the participants to use their own computers at home, which were already adapted according to their usage and personal preferences. When in the office, we tried to imitate their home setting, giving them a choice of using Windows or Mac OS and their preferred browser. We wanted to avoid the additional barriers of working on a new computer in an unknown environment, and for participants to experience the same situation as our registered students. Therefore, our introductions and instructions were limited to what they would get from an instructor in advance. We only limited their browsing by asking them to focus on specific pages rather than reading the whole course content. Focus group members were interviewed individually before and after the modifications. The first set of questions was about how their disability affected their ability to navigate the course material and what improvements would make the material more accessible for them. Questions after the modifications involved quality of the presentation, usability of the interface and usefulness of the system.

In our consultations with the participants, we asked them for their oral or written feedback and opinions on their experience. The names in these cases have been changed for privacy reasons.

CASE 1: SAMUEL

Description. Samuel is a hard-of-hearing English as a Second Language (ESL) student from Korea. Online courses had been recommended to him as a good choice to remove the barrier of his impairment.

Issues. Samuel was surprised and disappointed with the amount of text-based material in the courses that he took. He compared them with the online courses in Korea, which included a considerable amount of video excerpts. Because English is not his native language, Samuel struggles in traditional classroom classes. Despite that, he would rather meet face-to-face, or use a webcam to see emotions and gestures, than attempt to pick them up from text alone.

Comment and recommendation. Making content text-only does not necessarily make it more accessible. It works well with a screen reader, but there is no benefit for a hearing-impaired student. Instead of omitting all the media, more attention should be devoted to providing alternatives to pure audio, such as transcripts, or captions for video components. See the example in Figure 11.7 where a video segment is accompanied by transcripts and audio.

Webcam support is a common feature in instant messaging software, and students are increasingly comfortable with its use. While not every student can reasonably be expected to own a webcam, video messaging supported by text messaging would be of greater benefit to Samuel than a standard text-based forum, allowing him not only to see others' facial expressions, but also to encounter and practise spoken English at a functional level.

CASE 2: TED

Description. Ted is an ESL teacher with a condition which causes his eyeballs to continue rotating when focusing on an object. He does not often use a computer, as he has to learn programs by memory rather than use visual cues. He finds himself lost when searching on the Internet.

Issues. For Ted, text tends to wobble: small text is very difficult to read, and line spacing must be great enough to clearly separate the lines. Ted increases the font size in his browser when reading from the Web.

Comment and recommendation. One of the main goals here was to help Ted focus on the page. The layout of the pages was improved and made easier to read, with shorter line length and greater line spacing. The graphics that are too small have a "magnifying glass" option to zoom the image. See example in Figure 11.8.

Location cues are critically important for Ted. This was implemented by highlighting the title of the current page in the left-hand navigation menu, which can be seen in Figure 2. This is a benefit not only for those with visual impairments, who can refer to the highlighted line as a visual bookmark, but also for people with learning disabilities or those whose native language is not English, who benefit from the reinforcement of location information in the title and navigation menu of the page.

Use of a screen reader, such as Wynn, is recommended. The tool highlights the lines of text currently being read. Ted uses his finger to follow the line of text. This software will help his eyes focus on the highlighted portion of the content, as well as provide an audio option.

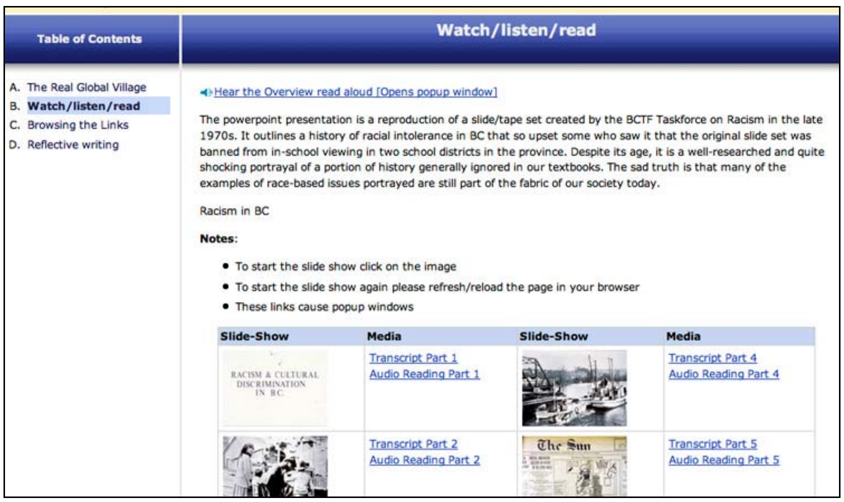


Figure 11.7. Providing audio and transcripts with a media component

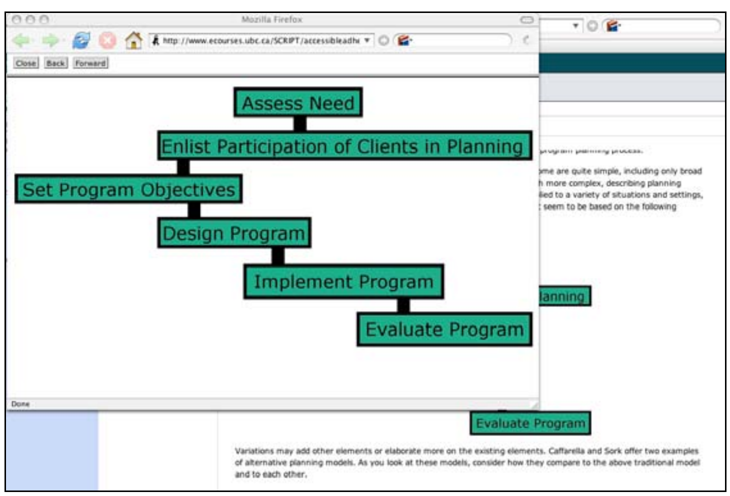


Figure 11.8 Enabling "magnifying glass" to zoom the image

CASE 3: ROBERT

Description. Robert had nerve damage to his right hand and cannot use a standard keyboard. A standard mouse is also difficult for him to use, so he usually uses a tablet. He recently acquired a Frogpad, a one-handed, 20-key keyboard that uses key combinations. So far he can type about 10 to 20 words per minute.

Issues. Robert requires additional time when writing exams, especially when handwriting; he prefers to type even though it is still slow. He says he would be unlikely to use a discussion board or chat room. To date, he has not used voice tools, but says he could not use them in a crowded lab.

Comment and recommendation. Making special arrangements for assignments, such as extending the deadline, or submitting it in a different format is a solution that has to be discussed with an instructor. Students who have problems and need special accommodations often do not report them to their instructors. A note coming from the instructor or administrator at the beginning of the course, explaining the possibilities of those accommodations, will encourage students to express their concerns.

Introducing audio tools, such as voice discussion boards or voice instant messaging, may save Robert's typing time and effort. If access to the necessary hardware could be obtained, assignments that can optionally be submitted in alternative formats, such as audio or video presentations, may also be appropriate.

CASE 4: GEORGE

Description. George has been blind since birth, and relies on a computer with JAWS for Windows, a talking screen reader program, which enables him to access the Internet as well as many other PC applications.

Issues. George has taken courses online in the past, but finds WebCT cumbersome to navigate. The popular course management system is based on framesets, which are not optimal for JAWS, as when a single frame updates it is difficult for a blind listener to determine what has changed on the page. Navigation is distributed across multiple framesets and implemented in JavaScript, which behaves differently in the JAWS reader than standard HTML.

Comment and recommendation. Many of the improvements that can help students such as George are the familiar guidelines of the WCAG. Here, the challenge is not simply to adapt the material, but to make course developers aware that these changes are necessary.

One such example is a diagram that is not easily described with a few words in Figure 4, a longer description was needed. This piece of text explains the diagram, ensuring that no relevant information is lost.

George, who is interested in a radio broadcasting career, was asked if he would prefer to submit assignments as audio readings rather than written assignments. He responded that the material for an audio reading must either be prepared as written text in advance or else the final audio must be edited, which is a less accessible option for a blind user than a standard text editor. Nevertheless, he was appreciative of the idea of offering students alternatives.

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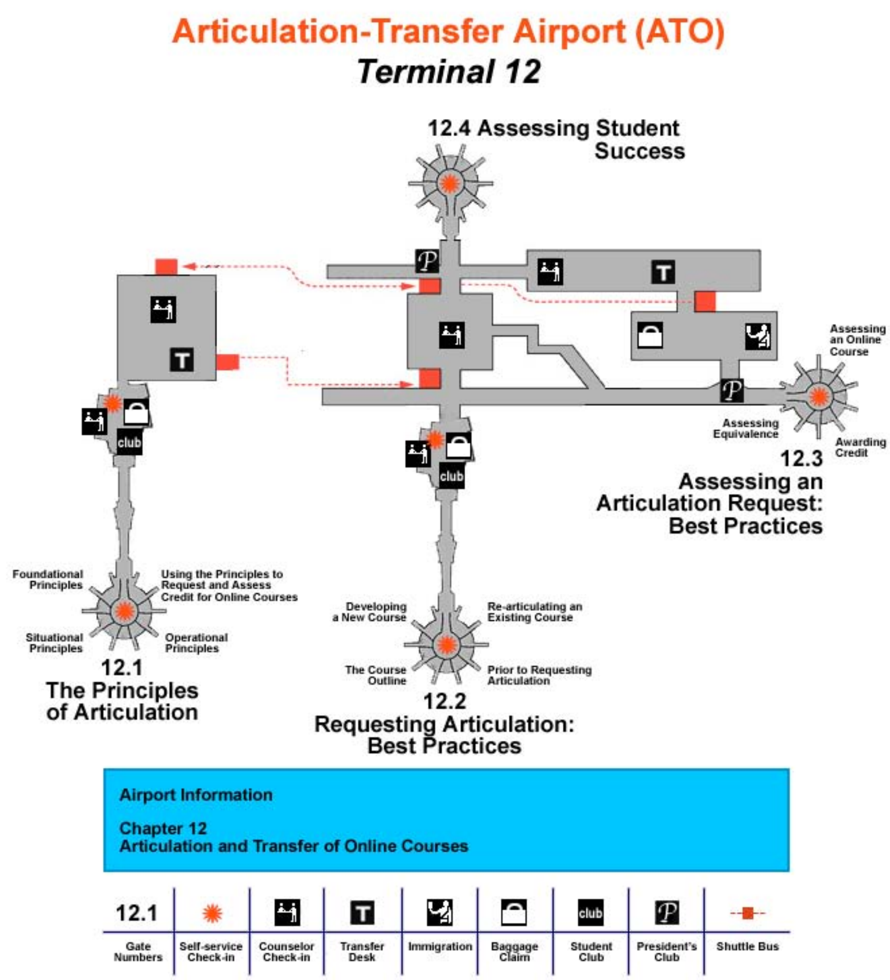
12
Articulation and Transfer of Online Courses

Finola Finlay

’Cause it ain’t transfer any more: it’s mobility. – Clifford Adelman, Senior Associate at the Institute for Higher Education Policy, Former Senior Research Analyst, US Department of Education



Learning outcomes

After completing this chapter, you should be able to:

- Identify the important characteristics of an online course outline.
- Use sound principles to articulate an online course for transfer credit.
- Minimize transfer difficulties for students who take online courses.

Introduction

As the quote from Dr. Adelman[15] illustrates, students are mobile. They move between post-secondary institutions, carrying their accumulated credits with them in the expectation that the learning they have acquired will be acknowledged by the next institution they attend, that they will receive appropriate transfer credit for relevant courses they have taken and be able to apply that credit to fulfill program requirements. Formal transfer systems have been a feature of the higher education landscape for at least 50 years in North America, and are rapidly developing in Europe (though the European Credit Transfer System) and elsewhere. Online learning has had a significant impact on mobility and transfer: students can and do access high quality courses from all over the world, and deserve to be awarded transfer credit for their learning, where it fits with their educational program.

In any post-secondary environment where transfer of credits is permitted and encouraged, transfer credit is based on course equivalency. Within a provincial, state or national transfer system, course-to-course transfer credit is often established as soon as a new course is developed, in advance of any student enrolling. The process begins when the sending institution submits a course to the receiving institution, with a request that the receiving institution assess the course for equivalence to one of its own courses. Once that assessment has taken place, and transfer credit awarded, a course is said to be "articulated." For example, a college course on the Sociology of the Family, Soci 220, may be assessed as equivalent to a university course called The Modern Family with the number Soc 235. Or, there may be no direct equivalent at the university, and the transfer credit awarded might be for "three credits in second year sociology". The transfer credit is listed in the institution's database, and students know in advance what credit they will receive after transfer for the sociology course they have taken.

In some jurisdictions higher level articulation agreements are often negotiated, such as 2+2 agreements (associate degree to degree, diploma to degree) or agreements about the general education curriculum. Such agreements can be local or statewide but the principle at the heart of the transaction remains the same: transfer is awarded when an assessment of the curriculum, program or courses at the sending institution reveals an appropriate match with that at the receiving institution. The other common way in which transfer credit is assigned is on the basis of a student request: the student presents a transcript, and an analysis is conducted of the equivalence of the courses he or she has taken to those in the institution to which he or she is transferring. Such case-by-case assessments may remain one-off, but may also result in formal or recorded articulation agreements.

Articulation, then, is a process of jointing two or more elements, to allow them to function as a coherent whole (as the femur is articulated with the tibia to form the main structure of the leg) and through this process students can move from institution to institution while maintaining a sound educational program and working towards their chosen credential. Articulation agreements, whether course-to-course or higher level, have traditionally been negotiated locally, either between a university and its nearest feeder institutions, or within a state or provincial transfer system in which institutions are familiar to each other, and relationships and infrastructure are developed to support the transfer environment. They have also predominantly been concerned with the assessment of courses offered in the traditional and familiar face-to-face classroom environment.

Increasingly, however, institutions are being asked to assess the equivalence of courses taught in online formats. Herein lies a central dilemma for a transfer environment—transfer systems are organized locally, but online education is developed and delivered globally.

Faculty who assess online courses may be faced with several challenges: the time available for the task, the level of information available about the course and the institution delivering it, their own understanding of the norms of an online environment, their own commitment to online learning, and their institution's policy regarding the acceptability of online courses or regarding the accreditation status of the sending institution.

[15] *Building a Culture of Transfer*. Keynote address, Fourth Biennial Conference on Articulation and Transfer, Tempe, Arizona, July 2007.

Even within an integrated post-secondary environment characterized by open and transparent articulation relationship, faculty frequently raise the question of whether mode of delivery can affect, or should affect, the articulation of a course. For example, in British Columbia, faculty members from each institution in the BC Transfer System meet every year in discipline-based groups, known as Articulation Committees. These committees operate under the aegis of the British Columbia Council on Admissions and Transfer (BCCAT). Meeting minutes collected by BCCAT reveal that the articulation of online courses is often debated (BCCAT 2005). Issues and concerns are varied:

- Many groups are enthusiastic about converting their curriculum to online delivery formats, and see this mode of delivery as attractive to potential students
- Concerns are raised about quality control, and about assessment methods used in online courses and how student evaluation is safeguarded and authenticated
- Some faculty worry about the use of online delivery for students who need intrinsic motivation, structure and an encouraging classroom atmosphere, especially academically fragile students in developmental programs
- Faculty query how lab, field work, practica, and other non-classroom experiences can best be organized in online courses.

Where such discussions become problematic is where, in the absence of reliable information and processes for assessing equivalence, faculty and administrators with concerns about online learning deny transfer credit to students who have successfully completed online courses.

In some cases, the accreditation of the institution delivering the online courses is cited as the reason for denying transfer credit. In this scenario, the courses are often not assessed. Rather, credit is denied on the basis of where the course was taken, regardless of its quality or content. Carnevale (2002) outlines the "rude surprise" awaiting students who try to transfer such courses.

Concerns will always exist about the quality of some deliverers of courses and programs, including online courses. However, for legitimate institutions and their students, it is vital that evaluators can rely on excellent information about the online courses and can call on sound principles and processes to evaluate them for transfer credit. In this transaction, both deliverer and evaluators have parts to play. The ultimate beneficiaries of a sound articulation process, however, are the students, who can be assured that their learning will be appropriately recognized. All articulation should, after all, support the fundamental principles of equity on which an articulation environment is built: *that students should not have to repeat content which they have already mastered, nor be denied credit because of technicalities. Nor should they be credited with learning they have not acquired, especially if that learning is fundamental to their advancement to further study, or a required element of their program* (Finlay 2005, p. 7).

Many jurisdictions and organizations publish "best practice" statements for online education. For a good example see the Commission on Institutions of Higher Education (CIHE, no date) *Best Practices for Electronically Offered Degree and Certificate Programs.* Others provide sets of guidelines exhorting their members to be fair and reasonable. However, most of these documents provide little guidance as to what "fair and reasonable" actually looks like in practice. Few resources exist that will assist practitioners at sending institutions to ensure the successful articulation of their online courses, and give the assessors at receiving institutions the tools they need to make confident decisions. This chapter aims to fill that gap.

The principles of articulation

When considering how to articulate a course for transfer credit, evaluators are faced with numerous decisions. Fortunately, they can turn to a number of principles to guide them as they try to ensure that courses are articulated fairly and consistently. These can be divided into *foundational principles, operating principles,* and *provisional principles.*

FOUNDATIONAL PRINCIPLES

Foundational principles are those which lie at the core of decisions about *all* articulation of courses and programs.

- ***Equivalence:*** Equivalent means "equal in value".[16] A course submitted for articulation will likely never be identical to the corresponding course at the receiving institution. The assessment of equivalence involves identifying the degree to which it matches in content or outcomes. Discipline and program contexts will dictate the relative importance of the similarity.
- ***In lieu:*** The act of awarding transfer credit implies the acceptance of a course *in place of* a course or program requirement offered at the receiving institution. The course to be transferred does not have to be

[16] *Oxford Dictionary.*

identical to the course for which transfer credit is granted, but the degree of similarity should ensure that students will have the necessary knowledge and background to be successful in more advanced courses.

- ***Applicability:*** It is appropriate to award transfer credit for courses that can be used to fulfill the specific or general requirements of a credential or program at the receiving institution.
- ***Fairness:*** Provisos and restrictions (such as adding a specific grade requirement) should not be placed on equivalent courses unless those same restrictions apply at the institution awarding the transfer credit, or there are clear and defensible reasons for doing so.

SITUATIONAL PRINCIPLES

Situational principles provide useful guidance but are not universally applicable. While they form part of the decision-making toolkit for articulation, situations and contexts create provisos for their application. Two such principles are relevant to the articulation of online courses.

- ***Pedagogy:*** Under some circumstances it is appropriate to consider *how* a course is taught. Factors such as cultural sensitivity, or opportunities for practising skills, may be integral to content mastery. See "Awarding Credit" below, for more on pedagogy.
- ***Delivery:*** How a course is delivered is normally immaterial to its articulation, since teaching a course in a distance delivery format (as opposed to face-to-face) should not affect its equivalence. However, there may be occasions where the content is intrinsically linked to delivery, and an alternative mode impacts on equivalence. It may also be relevant whether a course is offered only online, or if an online course is a version of a course normally delivered in a traditional classroom.

OPERATIONAL PRINCIPLES

Operational principles refer to practices and attitudes that will facilitate articulation. In the case of online courses the following two are relevant:

- ***Comparability:*** Since it should be possible to compare courses, the elements of the course must be clearly outlined and should be interpretable by faculty in the same or a related field. The best assurance of comparability is a course outline that is comprehensive enough to allow for the assessment of equivalence, and that conforms broadly or specifically to the local norms of course description.
- ***Transparency:*** Assessment practices should be open to scrutiny. Any individual who assigns transfer credit based on the assessment of a course should be prepared to explain the reasons for the decision, including any influencing factors.

USING THE PRINCIPLES TO REQUEST AND ASSESS CREDIT FOR ONLINE COURSES

The course developer (at the sending institution) and the course assessor (at the receiving institution) both have a part to play in ensuring that appropriate transfer credit will be allocated when a student transfers. The onus is on the course developer to provide accurate, detailed and honest information about the course, while the assessor must base his or her decision on sound principles, and act fairly and in the best interests of the student.

Requesting articulation: best practices

DEVELOPING A NEW COURSE

Every course fulfills multiple objectives for students, instructors, departments, and institutions, and all those objectives must be taken into account as the course is being developed. Sometimes other objectives are more important than that of transferability. For example, if a college has determined that students have difficulty with certain content, it may develop a remedial course designed to bring them up to the standard of knowledge required for subsequent success in the discipline. This is sound pedagogical practice, even though the course may be denied transfer credit because it is viewed as preparatory. There are other reasons why a course may be difficult to articulate: it may be unique in the system, for example, or may be offered in response to localized social or economic conditions, or to take advantage of faculty specialization. At the same time, if a course *is* designed to transfer, it must be consistent with the norms, content and standards of the receiving institutions with which articulation is sought. It does not have to be identical to a course at a receiving institution—in fact, if it is to articulate widely, it must often integrate aspects of similar courses at several institutions.

THE COURSE OUTLINE

A detailed course outline is the starting point of any articulation process, since articulation demands a close examination of course elements in order to establish equivalence.[17] While most institutions have developed satisfactory course outline templates for traditional courses, they do not always contain the level of detail necessary to establish equivalence. In the case of an outline for a new online course, besides ensuring it contains all the necessary information to ensure that an assessor can determine equivalence, special attention should be paid to the following course elements:

- Student evaluation, including how exams are safeguarded, and authentication measures to identify students taking exams. The importance of providing this information can not be overstated. The CIHE Best Practices document states:

  > When examinations are employed (paper, online, demonstrations of competency, etc.), they take place in circumstances that include firm student identification. The institution otherwise seeks to assure the integrity of student work.

- If proctoring is used, what are the procedures for selecting proctors, establishing student identity, assuring security of test instruments, administering the examinations, and assuring secure and prompt evaluation?
- If other methods are used to identify those who take the examination, how is identification firmly established? How are the conditions of the examination (security, time limits, etc.) controlled?
- Does the institution have in place effective policies and procedures to assure the integrity of student work?
- How hours are assessed, and what is expected from the student for hours of learning versus hours of instruction.
- How labs, practica, field work, or other non-classroom requirements are supervised and assessed.
- Expectation regarding academic honesty. For example, the student Handbook for Charter Oak College in Connecticut (http://www.charteroak.edu) states:

  > Charter Oak State College may discipline a student in the following situations:
  >
  > For academic dishonesty, which shall in general mean conduct, which has as its intent or effect the false misrepresentation of a student's academic performance including but not limited to: (a) cheating on examination; (b) plagiarizing, including submission of another's ideas or papers as one's own; (c) stealing or having unauthorized access to examinations; (d) falsifying records, transcripts, test scores or other data or (being represented by another individual for all or part of a distance learning course.
  >
  > By registering for a Distance Learning course, a student attests that all assignments submitted and examinations completed are the work of the enrolled student. Dishonesty will result in an "F" in the course and may incur other disciplinary action for Charter Oak State College students including dismissal from the College.

- How student learning is supported in the online environment, including provision for collaboration between students and interaction with instructors.
- How library or other learning resources are accessed and used and the expectations for original research and use of such resources.
- Links to institutional and program URLs, and to any additional helpful information such as institutional policies regarding instructor credentials, lists of faculty associated with the program, or institutional or program accreditation or authorization.
- Whenever possible, a statement specifying what general or specific transfer credit the course should be awarded, including the year level credit. If the course has already been offered, existing articulations should be listed, along with a link to any online transfer guide containing that listing.

All course outlines should provide a detailed list of the topics covered, even if learning outcomes are also specified. Faculty members at institutions that do not design their courses from an outcomes perspective need detailed topic-based information to determine the best transfer equivalence.

PRIOR TO REQUESTING ARTICULATION

Check existing articulations. Search your state or provincial transfer guides, or those for nearby institutions, for similar courses. By this means it is possible to establish which other sending institutions have equivalent

[17] A *Transfer-Friendly Course Outline Form* can be found online at www.bccat.bc.ca/outline. This resource was developed to help reduce the number of situations where transfer is denied because of inadequate content and detail in the outline.

courses already receiving transfer credit. Those course outlines may be instructive, since they already receive the desired credit.

Consult colleagues. Once a draft course outline is ready, a developer can use the expertise of articulation committee members or willing colleagues for advice or feedback.

Reflect on, and balance advice received. Asking for advice and feedback on a course can be a sensitive area for faculty. Professional responsibility and autonomy include the freedom to develop and teach a course according to one's professional judgment. Requesting advice from a faculty member at the receiving institution acknowledges that the receiving institution may exert some influence over the content or the structure of the course. Occasionally, a faculty member from a receiving institution responds by requesting modifications that may be unacceptable to the sending institution or that may compromise the transferability of the course at other institutions. In these instances, best practice involves communicating as diplomatically as possible and seeking a mutually acceptable solution.

Decide when "no credit" is acceptable. It is recognized that in some instances an award of "no credit" is appropriate, and is acceptable to the sending institution. For example, it may be important that students understand clearly that a course will not receive transfer credit at certain institutions, since they will then be in a better position to plan their transfer program. If an award of "no credit" is not acceptable, continued negotiation will be necessary.

Ensure that students are clear about transfer credit. Many student complaints about transfer credit occur because of a false expectation that a course will transfer, or will transfer as *assigned credit* rather than *unassigned credit*, or will satisfy a program requirement. Instructors should include information regarding course transferability in course syllabi, wherever possible.

RE-ARTICULATING AN EXISTING COURSE

Many online courses have already been delivered for years in traditional face-to-face mode. When a course has been redeveloped for online delivery, the question arises whether or not it should be re-articulated. However, once a course has been articulated and transfer credit established, it should be re-articulated *only* if the redevelopment results in *substantive* change.

- *Substantive change to content or subject matter, or to objectives or outcomes*. Course articulation is based on the principle of the equivalence of academic achievement and of knowledge and skills. Substantive changes, therefore, are changes to the content, subject matter, topics covered, or objectives/outcomes that will alter the equivalence of the course and therefore will likely the transfer credit which the course is awarded at other institutions. This is not intended to include relatively minor changes in topics, changes in texts, materials, or assignments, reasonable modifications to learning outcomes, or changes intended to update the course or keep it in line with the evolving norms of the discipline. Nor is it intended to include change in delivery mode, unless that change substantively affects the elements listed above.
- *Substantive changes to assessment criteria or evaluation methods, only if certain assessment methods or weighting are integral to the articulation of a course.* For example, some institutions require all courses, or certain courses, to have a final exam, and some require that a percentage of the final grade be based on a final exam. In the case of online courses, changes in evaluation methods may be considered substantive if, for example, they impact on the perceived integrity of the exams or assignments.
- *Changes to the number of credits assigned to the course, or to the number of contact hours.* Normally, a change to credit hours signals that content has been added or subtracted. Such changes affect equivalence and in turn the transfer credit assigned to the courses, including the number of credits awarded. Therefore re-articulation is appropriate.

Assessing an articulation request: best practices

In each discipline the traditions, norms, and body of knowledge of that discipline exercise a broad influence over what is appropriate to cover in introductory, intermediate and advanced levels. Additionally, each institution's academic governance normally scrutinizes and approves every new course and program, and assesses its suitability for inclusion in the calendar. At the same time, the norms of academic autonomy include the right and responsibility of faculty members to design and teach a course according to their own professional judgment, faculty teaching the same course in the same institution may choose different texts, readings, assignments, exercises, topics and evaluation methods. In the same way, a post-secondary course with the same name or title will not be identical from one institution to another, and the degree of similarity may vary according to the discipline.

ASSESSING EQUIVALENCE

There are several approaches to assessing equivalence.

- *Content:* There is no universal rule regarding the percentage of match since it is recognized that an appropriate match can vary from discipline to discipline. In some disciplines, where mastery of key concepts is prerequisite to success in subsequent courses, it may be vital to have a substantial match of content in courses. Some institutions or disciplines have developed a rule of thumb for the percentage of match while others make case-by-case judgments. Best practice, however, is to avoid inflexible rules about percentage of match, and to focus on discipline and context-appropriate content.
- *Outcomes:* Courses can have similar goals, objectives, aims, and outcomes, even if the content varies. For example, two writing courses may use different texts, assignments, instructional styles, methods of delivery, and evaluation and grading practices, and yet have the same goal of teaching students to write at a post-secondary level.
- *Level:* A course which has no equivalent in the calendar of an institution may still be suitable to satisfy some of the elective requirements of a credential. For example, some institutions may not offer linguistics, criminology, religious studies, archaeology, languages, or courses in applied and professional studies. However, if a course is taught at the appropriate level and the standard expected of students is equivalent to that of the credential to which the credit can be applied, it can be deemed equivalent for the purposes of awarding unassigned or elective transfer credit.

ASSESSING AN ONLINE COURSE

Evaluating a course for transfer credit involves assessing its equivalence to a specific course at the receiving institution. Evaluators must take a fair and balanced approach to the assessment of all courses, and this should be no different for online courses. The assessment must be based on the variables of equivalence, as outlined above, and delivery mode should only be taken into account if it appears likely that it unduly impacts on the equivalence of the course to possible matching courses at the evaluating institution.

If a realistic assessment is not possible, because of the paucity of information provided by the sending institution or the student, reasonable efforts should be made to request a satisfactory course outline, upon which a sound decision can be based. While the onus for procuring this has often been placed on the student, electronic communication methods have made this easier. However, the reality is that an evaluator only has so much time for the assessment task, and cannot be expected to hunt down information. Given this, it is fair to reject a request for transfer credit if the evidence presented does not allow for an adequate assessment of equivalence, or raises unanswered questions about the integrity of exams, the hours of learning expected, or any other variable deemed as a *sine qua non* in a reasonable assessment process.

AWARDING CREDIT

For a student, the best type of transfer credit is assigned credit. Transfer credit is assigned when a course is assessed as being equivalent to a specific course at a receiving institution. For example, College X MATH 111 = University Y MATH 100.

Most credentials require that students complete certain courses at each level. Awarding *assigned* credit allows students to demonstrate that they have fulfilled requirements. Therefore, it is sound practice to award assigned credit wherever possible.

If the course is appropriate for credit in the discipline, but no close match can be established with a department's courses, then "unassigned" discipline-specific transfer credit can be awarded. This type of credit verifies that the course is taught at the expected level and standard, that it conforms to the norms of the discipline, and that it is suitable as an elective credit within a degree program. Students can usually use unassigned credit to fulfill general program requirements. More general designations, such as "Arts (3)" or "Humanities (3)" can be used where the receiving institution does not have a corresponding discipline, but the course is identifiable as appropriate for elective credit within a faculty or program. If the course has no corresponding discipline, program, or faculty, but is obviously at the appropriate academic level, the receiving institution can use a designation such as "general elective." In rare cases, an institution may use this more general designation for a course for which they have a corresponding discipline, but which appears to fall outside the norm for how similar courses are delivered or organized at the institution.

"No credit" is an articulation, and will appear in the institutional or provincial/state transfer guide. Awarding "no credit" means that a student is denied credit for learning achieved, and must replace that credit with additional coursework. This is expensive for the student, the institution, and the system. Where an institution does not offer a similar course or program, every effort should be made to award a minimum of elective credit.

There are two situations in which it is acceptable to award "no credit".

- The course is not taught at the post-secondary level. A course which appears to be English composition, but which is really English as a Second Language, will be evaluated as being preparatory. Many courses are not designed for transfer (e.g., purely vocational courses such as welding, or preparatory courses such as high school algebra) except to similar programs at other institutions. Occasionally such courses are submitted for articulation in error.
- A "no credit" is appropriate when it is clear that there is no possibility of the student applying credit for the course towards any program at that institution. For example, a specialized course in a technology, a practicum course for a professional program, or a studio or field course in a subject not congruent with the programs at the receiving institution may not be applicable to any credential.

A word about pedagogy: normally, *how* a course is taught is assumed to be immaterial to the assessment of equivalence, but there are some cases where the manner in which a course is structured and taught is integral to content mastery. For example, at one university, in order to assign a W ("writing intensive") designation to a course, a committee assesses the nature and number of opportunities for students to write and revise. In some First Nations courses culturally sensitive pedagogy may be inextricably linked to course content. In such cases, best practice requires the receiving institution to communicate its expectations clearly.

Assessing student success

In the British Columbia Transfer System, as in many other systems, the effectiveness of the transfer system is subject to intense examination. One approach to this is to assess the performance of students after transfer, to evaluate the extent to which their sending institution has prepared them well for more advanced courses, and by extension whether the articulation process can hold up to scrutiny. Numerous research approaches have demonstrated consistently that the transfer system in British Columbia is very effective indeed. Students graduate at similar rates to those students who enter universities directly from secondary school (direct entrants), and achieve comparable grades. Five years after graduation, transfer students are virtually indistinguishable from direct entrants.

In one case, however, research into student performance pointed to an issue affecting an online course: students were enrolling in suspiciously large numbers for a English course offered online by a college, and achieving higher grades than appeared warranted by their scores in English placement tests. Due to effective communication between the institutions involved, the issue was addressed immediately by the responsible institution and steps were taken to rectify the situation, caused by insufficient oversight of student assignments and exams. However, such instances can shake the faith of many in the system in online course integrity and contribute to the hesitancy with which some evaluators approach the awarding of transfer credit for online learning. It is imperative that, in an articulated system, both sending and receiving institutions are open to scrutinizing the effectiveness of their transfer agreements, and the integrity of their course delivery methodologies.

Summary

Best practice in articulation refers equally to online courses as to face-to-face courses. Course developers should ensure that they do their homework in advance of requesting credit or offering the course, to ensure that the course, and the students who take it, will receive appropriate transfer credit. Once the course is underway, instructors must ensure that all possible safeguards are in place to maintain the integrity of evaluation of student performance. Evaluators, on the other hand, need to make decisions based on sound principles, and to judge a course by what is really germane to its equivalence, and not allow themselves to be inappropriately influenced by its delivery mode. Working with the institutional research office to keep track of the subsequent performance of transfer students, including those with online courses, will build faith in the articulation process and help it stay on track.

As online learning increases in popularity and availability, it will become more and more important to ensure that descriptions of online courses are honest, detailed and accurate, and that decisions regarding transfer credit are sound, transparent, fair, and defensible. Paying close attention to both sides of the articulation equation will ensure that students can use online learning most effectively as they progress towards their educational goals.

> "The new electronic independence re-creates the world in the image of a global village". – Marshall McLuhan

Glossary

Articulation. The process used by post-secondary institutions to determine which courses are equivalent to one another. Articulation is normally a course-to-course analysis or comparison, but it can also involve whole programs. By extension, articulation refers to the development and implementation of agreements that provide for inter-institutional movement of students or the connecting of two or more educational systems.

Assigned credit. Transfer credit is assigned when a course is assessed as being equivalent to a specific course at a receiving institution.

Course outline. A description of the main content, organization and expected outcomes of a course, normally including the number of credits awarded for successful completion, hours of class time required, evaluation procedures, assignments, texts, and readings. In this chapter, a course is assumed to be the "official" description of a course upon which articulation decisions are based. (See also: **syllabus**)

Credit. The value assigned to a course. For example, many courses are valued at three credits. Most credentials specify the number of credits to be earned.

Receiving institution. The institution to which a student intends to transfer. In an articulation agreement, it is the institution which grants credit for course work completed at a sending institution.

Sending institution. The institution from which a student is transferring. In a transfer agreement, it is the institution where the courses were completed.

Syllabus. An individual instructor's version of the official course outline (See: **Course outline**), normally distributed to students at the first class.

Transfer Credit. The granting of credit towards a credential by one institution for programs or courses completed at another.

Unassigned credit. Transfer credit is unassigned when a course is assessed as being of a university level but not equivalent to a specific course at a receiving institution.

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13
Planning Your Online Course

June Kaminski and Sylvia Currie

Designers must do two seemingly contradictory things at the same time: They must design for perfection, and they must design as though errors are inevitable. And they must do the second without compromising the first. – Bob Colwell (2002)

Learning outcomes

After completing this chapter, you should be able to:

- Identify the primary considerations for planning an online course.
- Distinguish among design approaches.
- Apply the planning phase to your own course design context.
- Map your course elements and identify needs to support your design approach.

Introduction

> "The more you plan, the more room you leave for spontaneity". – *Vella (2006)*

Where does the process of planning a course begin? Where does it end? What does a course plan look like, and how does it differ from a course design?

This chapter provides an overview of the broad considerations in preparing an online course plan. A plan is a starting point for moving forward with the design, implementation, and evaluation of an online course:

- Who will you work with to design the course?
- Who will take the course and why?
- What do we know about the learners?
- How do instructor styles factor into the planning?
- What are the main components of the course?
- How will the course be organized?

Even the most open-ended learning activities begin with a plan. However, a plan will, and should be, refined and adjusted during implementation. In this sense a plan evolves, but it continues to provide a sidebar of sorts; something to guide the decisions about the design work that needs be carried out. A plan can be both an ongoing reality check, and way to focus on important elements of a course design.

Can you make patterns from clouds?

> "Part of the plan is knowing that the situation will compel you to change your plan". – Vella (2006)

A course plan can take on a variety of shapes, and is always informed by context: the audience, the venue, and the resources you have available to you. It is also informed by the educational values, beliefs, and philosophies of the design team. With so many possibilities and unknowns, how can we work towards a common language of what planning is all about?

The most basic question to begin with is, *why design* an online course. The emphasis here can be on the word *why*, or on the word *design*. A very common response to the question *why* is that learners will be geographically distributed, and having a course online is an obvious solution. However, an online course, or a course enhanced with online resources and communication tools, will add educational value to any face-to-face course by making resources available to learners and by providing opportunities to deepen learning through dialogue and sharing. In this sense the divisions between online courses and campus-based courses are becoming hazy. So the question of *why* is shifting from technology as a means to change the delivery method to technology as a means to enhance learning.

A more philosophical but very practical question emphasizes the word *design*. Is it important to create a structure in a virtual environment? How much design work should be done before involving the learners in the curriculum process? These questions have challenged educators for some time, and they seem especially complex when applied to designing online courses. Where then do we turn for guidance?

Some would argue that instructional design literature does little to guide the process of planning online courses because there is insufficient consideration for the social context of learning (Le Blanc, 2003). Furthermore, the recent advances in technologies to support networked learning,[18] or more informal connections among people and information, are challenging our notions about advance planning and fixed design of online spaces. Consider this description by George Siemens:

> By recognizing learning as a messy, nebulous, informal, chaotic process, we need to rethink how we design our instruction.
>
> Instruction is currently largely housed in courses and other artificial constructs of information organization and presentation. Leaving this theory behind and moving towards a networked model requires that we place less emphasis on our tasks of presenting information, and more empha-

[18] For interesting discussions and resources related to networked learning see the work of Leigh Blackall http://leighblackall.wikispaces.org/

sis on building the learner's ability to navigate the information—or **connectivism**.

Blogs, wikis, and other open, collaborative platforms are reshaping learning as a two-way process. Instead of presenting content/information/knowledge in a linear sequential manner, learners can be provided with a rich array of tools and information sources to use in creating their own learning pathways. The instructor or institution can still ensure that critical learning elements are achieved by focusing instead on the creation of the knowledge ecology. The links and connections are formed by the learners themselves. (Siemens, 2002)

The best plan will anticipate learner experiences, but provide plenty of opportunities for learner-defined goals and assessments. In broad terms, this would be called design for flexible learning. However, in practice, a systems and linear approach is often favoured because it ensures consistency and is more easily administered and supported at the organizational level. By planning out each **module** carefully in terms of instructional goals, content, assignments, and assessments, each course can undergo rigorous quality control.

Flexible and **systems approaches** represent opposite ends of the course planning spectrum, one more learner-centred (or more favourably referred to by Jane Vella (2001) as *learning*-centred), and the other more teacher-centred. With each approach there are obvious considerations for your own context. While a systems approach may require substantial resources, it may be more effective for managing quality control and for preparing and supporting instructors. Brent Wilson (1995), a pioneer in e-learning, has been cautioning online course designers about the downside of a systems approach for the past decade: An environment that is good for learning cannot be fully prepackaged and defined A more **flexible approach** will open the doors to more possibilities based on learner goals and needs. However, as pointed out by Bates and Poole (2003), "a flexible approach requires a high level of skill to be effective".

So to revisit the central question: Can we work towards a common language of what planning is all about? What are the patterns in the clouds?

There are many helpful models to guide the design process, each informed by learning theory and each providing a set of actions by phase (often overlapping) in the design process. There are too many to expand on in this short chapter—an Internet search on "instructional design models" will yield a dozen or more.[19] A model is useful for providing a framework for managing course design and ensuring that all decisions are attended to. Furthermore, a good model is cyclical so that evaluation and reflection on implementation will always inform the next iteration of the course design. Keep in mind that while learning theory and prescriptive models help to guide the work, a model "should be used only to the extent that it is manageable for the particular situation or task". In other words, context is always at the core of the planning and design process.

Figure 13.1. Photo "Mother and Child" by Joka http://flickr.com/photos/joka2000/

Prepare by considering these four tips:

(1) Begin with relevant metaphors for learning. Often the language commonly used to describe e-learning dismisses the notion that learning with technology is a valuable experience in its own right. When we speak about "distance learning", "covering course content", and "delivering courses" we are imposing an intent and framework for learning that calls for little involvement from the learner.
(2) The focus should be first on the learning, and second on the technologies that will support that learning. Think of your primary role in the planning process as keeping learning, and not technology, at the centre of the design process. Plan to include team members in the design process who can provide the expertise required to carry out your plan and also take full advantage of the medium.
(3) Creating good online learning experiences requires effort. While the basic planning guidelines are the same for both face-to-face and online courses, "the process of planning a quality e-learning experience is very likely to be more complex and time-consuming

[19] See http://carbon.cudenver.edu/%7Emryder/itc_data/idmodels.html for a comprehensive list.

than planning a conventional classroom experience. (Anderson & Elloumi, 2004)

(4) Context is king! You can choose an instructional model that suits your project and personal beliefs about teaching and learning, but always be prepared to adapt.

What are the roles of the design team?

> "The project management approach to developing and delivering technology-based teaching and learning ensures that resources are used efficiently and that individual team members contribute appropriate skills and knowledge to the project". (Bates, 2000, p. 68).

OVERVIEW OF THE DESIGN TEAM

Online courses are designed using a variety of configurations. For quite some time, a very common approach focused on the single instructor acting as content expert, course writer, and designer. This approach is what has been popularly called the "Lone Ranger" or "laissez-faire" style (Bates, 2000). "Certainly, there is a time in an organization when the laissez-faire or Lone Ranger approach may be suitable, and that is when a university or college is just beginning to commit to the use of new technologies" (p. 66).

A number of factors favoured this approach to design, most notably, cost and workload issues. The 'going it alone' approach is still alive and well in the e-learning landscape, but some experts stress that the disadvantages of this method far outweigh the benefits. "It is too hit and miss. It wastes resources, ignores the experience and many lessons that have been learned outside the higher education sector about how to design and develop creative media products and services, and above all fails to ensure high-quality, technology-based teaching in any consistent or widespread form" (Bates, 2000, p. 66). On the other hand, there are expert instructors who do have the pedagogical, technical, and content expertise to create viable and high quality courses on their own (Struthers, 2002). However, in reality, there are several different configurations adopted by various institutions, ranging from the single-course author supported by information technology experts to the extensive project team approach described in this section.

Current instructional design and e-learning research and practice usually stress the need for a project team approach, where a diverse variety of experts work together to create high quality, pedagogically sound courses and programs. This project team can be made up of a number of people filling specific team roles, the most common include a project manager, content or subject matter expert, a content writer, a **multimedia** developer, an editor, and an instructional designer. Often, a concurrent instructional design approach is used, where each member works on their portion of the project simultaneously or "as needed", creating a modulated, synergistic milieu for designing the course or program. For instance, once the content expert and writer have determined the desired topics and inherent content, the multimedia and/or graphic designer can begin to work on the supportive visual and multi-sensory content or learning objects to augment the foundational content.

There are some drawbacks to using the project team approach to course design. The biggest hurdle may well be teacher buy-in. Most faculty, especially in higher education, are used to functioning autonomously, and may be resistant to sharing the design of a course because of intellectual property considerations. "The project management approach is often seen as a bureaucratic, expensive, and unnecessarily complicated process, and a process that restricts the freedom and autonomy of the teacher" (Bates, 2000, p. 72).

Another possible drawback is the notion that project management can restrict the creativity and/or originality of the course designer. Obviously, there needs to be open communication between administration and the various members of the project team to be able to design a top quality course together successfully. As long as each member of the team is respected for their own expertise and contribution, and the issues of ownership and copyright are amicably decided, most teachers feel some relief that creative and knowledgeable team members support their efforts. Unless an individual course designer is multi-talented, with skills in content writing, editing, multimedia design, and so on, it is unlikely that a truly interactive, original, dynamic course can be created all alone.

HUMAN INFRASTRUCTURE

Four levels of human infrastructure support are fundamental to the development of any course or program, especially when done at an across-institutional, regional or national level (Bates, 2001). These include:

- **technology infrastructure support people** (design, maintain the learning network)
- **educational technology infrastructure support people** (design, maintain the learning interface structure such as navigation, screen components)

- **instructional design infrastructure support people** (coordinate the actual online course components and structure such as structure of learning activities or modules)
- **subject expert infrastructure support people** (design content, provide instruction).

INSTRUCTIONAL DESIGN TEAM ROLES

Often, the human infrastructure needed to design a high quality course is best achieved by appointing a diverse instructional design team. Each member of the instructional design team fulfills specific roles.

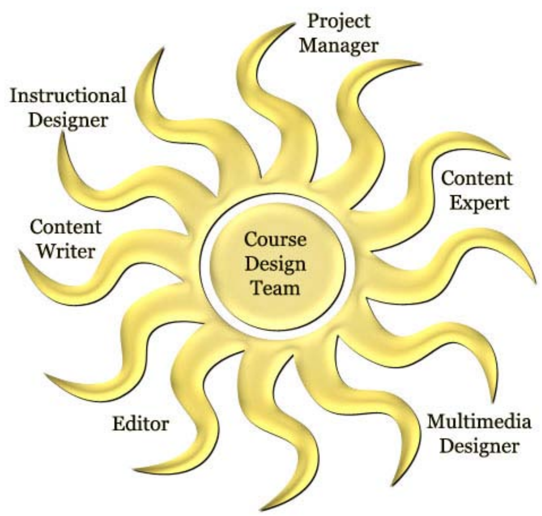

Figure 13.2. The ideal instructional design team work together in synergy.

Project manager

The project manager or leader often applies project management methodology to organize the project plan in conjunction with the rest of the design team. Often, the project manager liaisons with the instructional designer to set project start and end dates, determine what resources are needed to fulfill each project task, and set the project goals, challenges, milestones, and needs. The project manager is also responsible for ensuring that all team members are able to fulfill their tasks on time, and responds to challenges as they occur across the project timeline. The manager also coordinates copyright adherence and final details of the course project.

Instructional designer

The instructional designer is responsible for the course layout, branching, and positioning the written content within the online environment. Often the designer is involved with determining the course module or lesson objectives, the evaluative components, and may help the content writer and/or expert to develop the content. The instructional designer also works with the multimedia/graphics designer to determine the specific graphics, audio, video, movie and other multi-sensory components to augment the content. The role of coordination is often shared between the instructional designer and the project manager, to ensure consistency across the team, and to help identify problems and obstacles that emerge as the design process progresses.

Content or subject matter expert

The content expert is the team member who has well developed knowledge about the subject content. The content expert usually works very closely with the writer to ensure that the core essentials of the determined content are current, accurate, and meet the learning objectives of the course or program. The content expert also assesses the written content to verify that it addresses the intended audience, and, in conjunction with the instructional designer, helps to decide what multimedia and graphical objects are required to make the learning experience rich and meaningful for the learners.

Content writer

The content writer is the member who brings expertise in writing content for the course. Sometimes, one team member serves as both the content writer and subject matter expert. Their role entails researching the content, incorporating the input from the subject matter expert into the written component of the course (or sometimes, rewriting and editing existing content), and fashioning the content so that it suits the online course environment. The content writer works with the rest of the team to determine course and individual lesson objectives and other components, and selects the supportive materials such as text books and readings, usually with the content expert, instructional designer, and project manager.

Multimedia and graphics designer/technologist

The multimedia designer is responsible for designing the animations, visual graphics, audio segments, and other multi-sensory objects that will support the instructional requirements of the course. Working with all members of the team, especially the course writer, expert, and instructional designer, the multimedia designer helps to bring the course to life, providing a robustness and aesthetic appeal to the course design.

Editor or technical writer

The editor is responsible for ensuring that the content is well written and meets quality standards. The editor edits the course content for spelling, grammar, tone, and general usability, usually working closely with the content writer and the instructional designer.

> "Communication is human nature. Knowledge sharing is human nurture". – Alison Tucker, Buckman Laboratories.

Who's the audience?

GENERATIONAL COHORTS

One of the key tenets of sound online course design (and implementation) is that courses should be learner-centred. This can be a challenge, since online learners can come from a variety of age groups, sociocultural backgrounds, and lifestyles. Adult learners, for example, can belong to any one of four recognized generational cohort groups: silent generation, baby boomers, generation X, or the millennials (generation Y) (Raines, 2003). If teaching children, you may also be working with the group sometimes called the neo-millennials (Dede, 2007).

It is helpful to identify which generational groups will be taking the course you design in order to meet their individual and collective learning needs and preferences. The heart of this notion is that a generational cohort is a group of individuals born within the same range of years or era, who experienced common historical events and socio-economic (including technological and educational) developments as they grew from infanthood through adulthood. This commonality leads to the development of a similar overall world-view, and experience of the social environment around them. This concept was first introduced by Karl Mannheim (1936) and has been expanded by numerous scholars and analysts. Please note, that the notion of generational cohorts is not an exact science. The range of years for each generational cohort is quite varied, depending on the source consulted.

Common lifestyle expectations go hand in hand with these generational groups, which can range from single, young, still-living-with-parents learners through to sandwich generation learners (Statistics Canada, 2004) who are raising a family as they care for parents or other members of the older generation, as well as tending to their own career and education. On top of this, several demographic and socio-economic factors can distinguish the level of access to technology and educational/media resources, including economic status, gender, level of education, and geographic location. Thus, it is important to study your projected learners' characteristics in order to optimally meet their learning needs. (Sims, 2006) Table 13.1 below gives a tentative summary of our interpretation of the five generational cohorts who participate in the current educational landscape in one form or another.

> "A typical life-long learner is someone working mainly full-time, in a high-tech or service industry, with a family and a rich social and personal life. Such a learner requires "just in time" and personally relevant content delivered conveniently and flexibly. If they are professionals, they need access to the latest research and developments in their field". (Bates, 2001, p. 25)

AUDIENCE ANALYSIS

An audience (or learner) analysis is an important part of designing online courses (Sims, 2006). Particulars that are important include the learner's motivation for taking the course, the course's role in their career preparation, the purpose for taking the course (is it an enrichment course that helps to keep professionals current in their field, or perhaps a self-development course meant for personal enjoyment?), and whether the learners need to engage in cognitive, affective, and psychomotor activities in order to master the contents. All of these considerations are important and should guide team decisions related to e-learning and teaching styles, the presentation of the course, and exactly what content to include and to embellish with supportive graphics and multimedia objects. All of these considerations are easier to reflect on and address if the course components, audience, and other details are mapped visually in some way.

Table 13.1. Generational cohort characteristics

LEARNING GENERATIONAL COHORT		
GENERATION	**YEAR RANGE**	**LEARNING NEEDS**
NEO-MILLENNIALS	2000 to Present	Non-linear learners
		Even more social, interactive
		Seamlessly connected, networked
		"Naturally" technology-savvy
		Will grow up with high-definition network TV, Mp3s, mobile PCs, 3D wireless interactive games, wireless networks, initial agent technology, initial virtual reality
		Relate to rich multi-media, multi-sensory learning
MILLENNIALS (or GENERATION Y or NET GENERATION)	1982–1999	Consumers of knowledge
		Multi-taskers yet task-oriented
		High achievers, like personalization
		Prefer interactive, attentive instructors
		Highly social, interactive
		Highly connected, networked
		Have high technology-savvy
		Grew up with colour, cable TV, PCs, 3D video games, initial wireless, primitive virtual reality
		Expect some multi-media learning/enrichment
		Enjoy group work, experiential activities
GENERATION X	1965–1981	Self reliant and directed, individualistic
		Prefer flexibility and choice in learning
		Reject rigidity and authoritative approaches
		Expect expert, focused instructor
		Learning should be enjoyable, even fun
		Learning should increase their marketability
		Good to high technology-savvy
		Grew up with colour TV, PCs, 2D video games
BABY BOOMERS (or SANDWICH GENERATION)	1946–1964	Multiple responsibilities, high commuters
		High work ethic, dedicated achievers
		Prefer structured group work, crave feedback
		Use relationship-building activities
		Value creative and personal fulfillment activities
		Learning should be personally meaningful
		Fair to high technology-savvy
		Grew up with B&W, later colour TV and radio
SILENT GENERATION (or VETERANS or TRADITIONALS)	1925–1945	Most are retired now
		Prefer traditional learning environment
		Need risk-free learning
		Non-existent to good technology-savvy
		Grew up with radio and initial B&W TV (later years)

How do we move from concepts to mapping?

Tip
A common organizational and orientating technique used by individual course designers as well as instructional design teams is the use of visual models that serve to clearly outline the details, concepts, and content of the course being planned. Designers use various visual approaches, ranging from simple matrix tables to complex concept maps and storyboards.

CONCEPT MAPPING

The practice of concept mapping was first originated in the 1960s.by Joseph Novak (1977), while he was a professor at Cornell University. Many instructors are familiar with the use of concept maps for student learning, especially to help students investigate and brainstorm conceptual ideas. **Concept maps** consist of nodes (often drawn as ovals, circles or squares) that represent concepts, and connector links drawn as arcs, lines or arrows to represent the relationships between the nodes. The concept nodes are labelled, one for each idea or concept. Sometimes, the connector lines are also labelled.

Concept maps can also be used to plan educational experiences and provide a visual representation of the planned course objectives, outcomes, activities, resources, and evaluation. They help the design team visualize how the content should be linked and sequenced. As a team activity, concept mapping can help all members brainstorm ways to create a dynamic environment for learning the course-specific content. This mapping process produces a formal, step-by-step visual representation of the key components, and the connections and leveling between the components.

The ultimate structure and linking arrangement is very similar to the way a website is planned by designers. It is very helpful to the entire team to be able to see how the various course components should be arranged for effective learning and ease of use. Since Novak (1977) first introduced concept mapping, a variety of styles have emerged. The most common is called a spider concept map where a key overall concept is placed in a large oval or square node that then branches out to smaller nodes. The links that connect these nodes create an image that looks like a spider's web. Other configurations include hierarchical maps, landscape maps (an example is the image map at the beginning of this chapter), and systems maps.

> "Concept mapping is useful for knowledge management as a vehicle for externalizing "internal" expert knowledge, to allow that knowledge to be examined, refined, and reused". (Canas, Leake & Wilson, 1999, p. 14)

CONCEPT MAP CREATION

Every concept map possesses four core elements:

- **Patterns**—the overall structure of the map, e.g., a circular, central hub structure; a top-down hierarchical structure, a mandala (a complex geometric shape), a flow-chart, and so on.
- **Nodes**—the geometric shapes such as ovals or rectangles used to represent the individual concepts. Often these nodes are colour-coded to signify importance of or relationships among the various concepts
- **Connector links—**the lines, arrows, and curves used to indicate the relationships between concept nodes. Often a solid line is used to show a distinct relationship; an arrow refers to a causal relationship; while a dotted line shows a weaker, secondary relationship. An arc often represents a circular flow between concepts.
- **Connector words**—help to clarify the relationships between concept nodes. Common connector words include: based on, controlled by, including, may lead to, recognizes, part of, next step, recognizes, validates, stored in.

The first step in using concept mapping for course design is to create a textual structure of the course concepts, both major and supportive. Usually, these concepts are arranged in a list that shows the basic foundational order and relationships of the concepts to be covered in the content. Once this is done, the concept map can be initiated. For example, if a design team were planning to design a course on how to plan an online course, the main concepts might include:

Table 13. 2. Concepts used for spider concept map

ONLINE COURSE PLANNING
Rationale
Instructional Design Models
Instructional Design Team
Audience Analysis
Concept Mapping
E-learning Styles
E-teaching Styles
Packaging

The concepts in Table 13.2 are already mapped, using a landscape map approach discussed at the beginning of this chapter. If a spider map pattern had been used, the map might look like Figure 13.3 below. This sort of map is useful when first brainstorming the initial concepts of a course or design process. It will also appeal to design team members who like to plan and brainstorm in flexible, circular (rather than linear) ways. In order to incorporate a complete curricular plan for a course, a more complex spider concept map would be needed. This could result in a very meaningful, intricate map or it might be construed as too complex and confusing to people who prefer a more linear approach.

The spider map below has only one layer of surrounding concepts. It could be made much larger both vertically and horizontally by adding other layers of relevant concepts, connectors, and connecting words around the periphery of the existing map.

Figure 13.3. Spider map of online course planning

For teams that prefer a more linear visual organizer, a hierarchical, or a flow-chart, concept map would be more appropriate since both are organized to allow more layers and the connections and sections are clearly visible. These types of concept maps are linear, which may appear less creative to some team members. However, they afford a straightforward visual organizer to incorporate all of the processes of the course plan within the concept map, Figure 13.4 illustrates a simple hierarchical concept map of a short course with four modules consisting of three to five lessons each. The right column includes various multimedia and graphic objects that can be interwoven into the lessons and modules.

"The most powerful designs are always the result of a continuous process of simplification and refinement". – Kevin Mullet & Darrel Sano (1995)

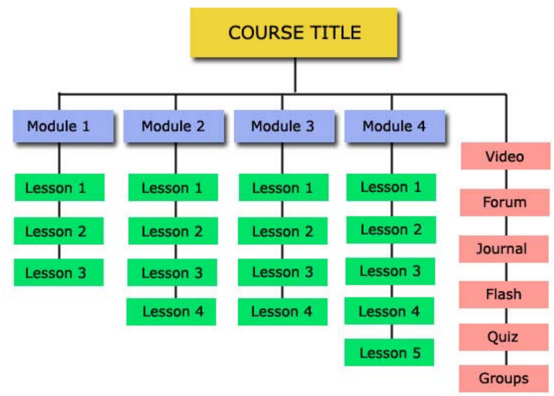

Figure 13.4. Hierarchical concept map of short course plan

STORYBOARDING YOUR COURSE PLAN

Storyboards are visual organizers that have been used by developers of films, videos, television shows, and multimedia for years. Most likely, your team's multimedia or graphic developer will use some version of storyboarding to plan the designated multimedia and video components of your course. This method can also be used by the entire design team to plan the actual course. There are various versions of storyboards. Professional audio-visual production teams often use ones that feature a rectangle for the actual drawing of a particular frame or scene, with lines to one side or below for data, ideas, and other textual reminders related to the appropriate scene. Figure 13.5 illustrates one row of a multimedia storyboard.

Some design teams prefer to use this layout for their storyboards, usually with more appropriate text headings in the lined area for writing notes. Figure 13.6 gives an example of this method. There are a number of different ways that storyboards can be incorporated into your design process. One popular method is the use of a flow-chart sort of storyboard, consisting of a connected geometric shape (often a rectangle) connected with arrows to detail the course design process. Figure 13.7 illustrates this particular type of storyboard graphic.

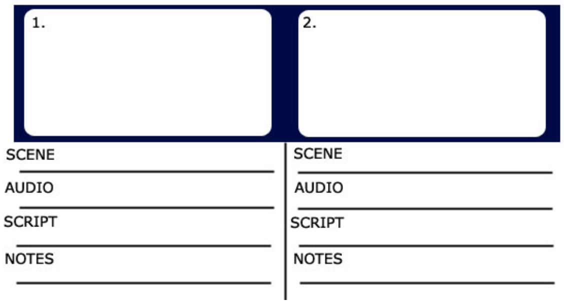

Figure 13.5. Multimedia planning storyboard section

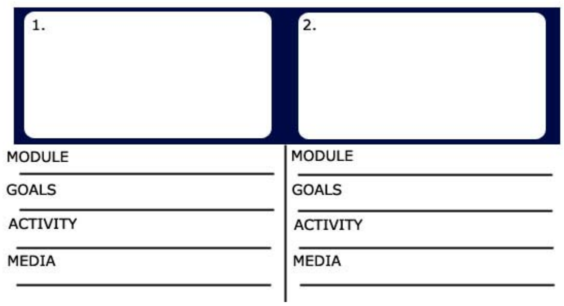

Figure 13.6. Course planning storyboard section

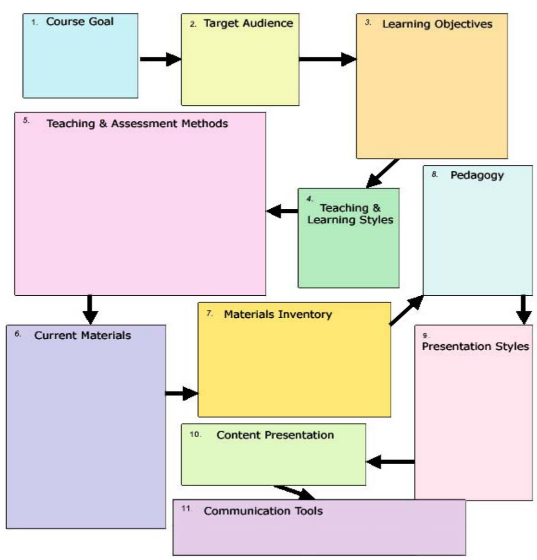

Figure 13.7. Flow chart style storyboard

Why should we consider e-learning styles?

Over the past three decades, a dozen or more learning style taxonomies have been created by various educational researchers. For example, Howard Gardner of Harvard University (Multiple Intelligences Profile) based his taxonomy on mind psychology, and David Kolb (1984) of Yale University and the Bates Institute (LSI—Learning Styles Inventory) based his on experiential learning.

The latter two and other learning style inventories based on them, such as the Honey and Mumford Learning Styles model (1992). based on Kolb's work; and Neil Fleming's VARK (Visual, Auditory, Reading/Writing and Kinesthetic) (2001) of Lincoln University in New Zealand, and the Memletics Accelerated Learning Styles (Advantogy, 2003) models, both similar to Gardner's Multiple Intelligences taxonomy, are particularly suited to online course delivery. All of these learning style models highlight student preferences and natural tendencies for processing information and understanding content. E-learning offers a rich medium for appealing to the diversity of learning styles if used in inventive, adaptive, and creative ways. The time to consider this is at the course planning stage, as the design team chooses the components and activities during the development process.

MULTIPLE INTELLIGENCES

> "We are all able to know the world through language, logical mathematical analysis, spatial representation, musical thinking, the use of the body to solve problems or to make things, and an understanding of ourselves and of others. Where individuals differ is in the strength of these intelligences: the so-called profile of intelligences—and in the way such intelligences are invoked and combined to carry out different tasks, solve diverse problems, and progress in various domains". (Howard Gardner, 1991)

Howard Gardner, a professor at Harvard University, hypothesized that people are capable of eight unique ways of information processing, which he called multiple intelligence theory. Information processing is the person's preferred intellectual approach to assimilating facts, information, and knowledge. Gardner suggested that individuals should be encouraged to apply their preferred intelligences in learning. Learners who have an understanding of their own particular learning styles can reflect on how to use their learning strengths and cultivate their less dominant ones. A key point in multiple intelligence theory is that most people can develop all eight of the intelligences to a relatively competent level of mastery.

Gardner's eight unique intelligences are:

(1) linguistic—verbal
(2) visual—spatial
(3) logical-mathematical
(4) bodily—kinesthetic
(5) musical
(6) interpersonal
(7) intrapersonal
(8) naturalistic

As online courses become more prevalent, new research is being done on how the multiple intelligences can be cultivated, and appealed to through the use of technology and multimedia in education (Veenema & Gardner, 1996). Since it is unrealistic to expect that the design team will know the learners' preferred learning styles beforehand, it makes sense to design activities and resources that can tap the strengths and meet the needs of all eight intelligences (Sims, 2006). Table 13.4 below provides some suggestions to guide this process.

Table 13.4 Multiple intelligences in online course planning

INTELLIGENCE	PREFERENCES	APPEALING ONLINE ACTIVITIES
Linguistic—Verbal	Written and spoken word, language, Literary activities, reading	Text, journals, forums, chats, wiki, blogs, written assignments, audio, dialogue, stories, debates
Visual—Spatial	Visual and spatial thinkers, sensitive to colour, line, shape, form, space and the relationships between these	graphics, movies, Flash, photos, multimedia, 3D modelling, design, charts, concept maps, diagrams
Logical—Mathematical	Detects patterns, scientific reasoning, deduction, mathematical calculations, cause and effect relationships	Socratic questioning, problem based, pattern pames, puzzles, experiments, statistics, matrices
Bodily—Kinesthetic	Fine and gross motor movements, sense of timing, and direction. Also physical coordination, balance, dexterity, strength, speed, flexibility, and proprioceptive, tactile, and haptic capacities	Role playing, psychomotor skills, demonstration, simulations, virtual reality, cooperative games, video games, ergonomic awareness
Musical	Musical ability and appreciation, Recognizes rhythmic patterns, pitch, melody, timbre, and tone colour	Audio, sound and music recording, rhymes, background music, chants, raps, create music
Interpersonal	The capacity to interact with others, to understand them, and to interpret their behaviour accurately. The ability to notice distinctions among other people, and to recognize their moods, temperaments, motivations, and intentions. A sensitivity to other's facial expressions, voices, and gestures, and the ability to respond effectively to these cues	Group projects, forums, Chats, email, cooperative work, teams, interviews, coaching, counseling, listening, clubs, drills, community involvement
Intrapersonal	The ability to sense one's inner being—to discover who we are, what feelings we have, and why we are the way the way we are. It represents our self –knowledge and our ability to act adaptively on the basis of this knowledge. It is our reflective self. Enables an accurate picture of the inner self, strengths and weaknesses, inner moods, goals, intentions, motivations, temperament, beliefs, and desires	Journals, reflective activities, independent study, autobiography, portfolio, concentration work, metacognition techniques, personal growth activities, narratives
Naturalistic	Awareness of the forces, principles, and laws of nature. Recognize relationships among species, enjoy nature-related classification systems. Promotes ecological awareness and stewardship	Ecological study, biology, natural sciences, charts, diagrams, taxonomies, genetic models, virtual field trips, systems, pattern recognition, nature analogies

KOLB'S LEARNING STYLES MODEL

David Kolb's learning style model is also quite amenable to course design planning. As well, this model provides a sort of developmental map for the cultivation of experiential learning throughout the human life span. Kolb described experiential learning as consisting of four stages: experiencing, reflecting, thinking, and acting. Kolb's experiential learning taxonomy comprises four distinct activities:

- concrete experience—(CE)
- reflective observation—(RO)
- abstract conceptualization—(AC)
- active experimentation—(AE)

and a four-type definition of learning styles (each representing the combination of two preferred styles, rather like a two-by-two matrix of the four-stage cycle styles, as illustrated in Table 13.5 below), for which Kolb used the terms:

- diverging (CE/RO)
- assimilating (AC/RO)
- converging (AC/AE)
- accommodating (CE/AE)

Diverging (concrete, reflective). A characteristic question of this learning type is "Why?" These learners respond well to explanations of how course material relates to their experience, their interests, and their future careers. These learners prefer an instructor who functions as a **Motivator.**

Assimilating (abstract, reflective). A characteristic question of this learning type is "What?" These learners respond to information presented in an organized, logical fashion and benefit if they have time for reflection. To be effective, the instructor should function as an **Expert.**

Converging (abstract, active). A characteristic question of this learning type is "How?" These learners respond to opportunities to work actively on well-defined tasks and to learn by trial-and-error in an environment that allows them to fail safely. To be effective, the instructor should function as a **Coach,** providing guided practice and feedback.

Accommodating (concrete, active). A characteristic question of this learning type is "What if?" These learners like applying course material in new situations to solve real problems. To be effective, the instructor should adopt a supportive **Constructivist** role, giving opportunities for the students to discover things for themselves.

LEARNER INTERACTIVITY PREFERENCES

> "Interactivity is not simply a function of computer-based transactions, but a fundamental success factor for teaching and learning, especially when implemented in an online context. In most cases, regardless of any virtual community that exists, the learner will be working independently and therefore the effectiveness of those communications (interactions) will ultimately determine the effectiveness and efficiency of the learning environment" (Sims, Dobbs & Hand, 2001, p. 514).

The theory of learner **interactivity** preferences (developed by Rhodes and Azball in 1985) also has meaning to the course design team. Again, it is difficult to predict the actual preferences of future learners, but measures can be taken to promote all three levels within the course design. These three levels are **reactive, co-active and proactive** interactivity preferences in structure and presentation, which correspond to each learner's cognitive activity. This theory described interactivity according to three different levels of quality. Later, other researchers added a fourth level, **reciprocal** interactivity (Sims, 1997; Sims, 2006). The four preferences are described on five functional levels through the following transactions: confirmation, pacing, navigation, inquiry, and elaboration.

Reactive interaction

A reactive interaction is a behaviourist response to presented stimuli, for instance, providing an answer to a question. This level of interaction within an online course structure shows very little learner control over content structure with program-directed options and feedback, the course components and activities are completely predetermined by the design team and instructor.

Table 13.5. Kolb's learning styles model

	Active Experimentation—AE—DOING	**Reflective Observation**—RO—WATCHING
Concrete Experience—CE—FEELING	**Accommodating** (CE/AE)	**Diverging** (CE/RO)
Abstract Conceptualization—AC—THINKING	**Converging** (AC/AE)	**Assimilating** (AC/RO)

Co-active interaction

A co-active interaction preference means the learner prefers more opportunities for choice and setting the pace for their own learning. A co-active online course design allows more control, providing learner control for sequence, pace and style of interaction within the online environment.

Proactive interaction

> "Proactive interaction is constructivist: the learner prefers to both construct and generate activities to support their learning. A proactive course design enables the learner's actions to go beyond selecting available information and reacting to existing structures, and generate individual constructions and elaborations beyond the rules set up by the design team and instructor" (Sims, 1997, p. 160).

Reciprocal interaction

Reciprocal interaction preferences means the learner wants a dialogue-like, reciprocity- based interaction with the online course interface and participants. This sort of interaction is usually found only in designs where artificial intelligence or virtual reality are situated. In these learning environments, both learner and system reciprocally adapt to one other. This level of interaction is rare in online courses, but is anticipated to be much more feasible in the not so distant future.

READINESS FOR E-LEARNING

Design teams can help their prospective learners prepare for, or at the least assess their own **readiness** to learn within an online environment. Research supports this as a critical consideration, since an individual learner's success in an online course often hinges on this foundation of readiness. Readiness entails three dimensions to assess: the learners' computer or technical skill, learning skills, as well as their time management behaviours.

Computer/technical skills: The more experience a student has in using basic computer skills (use of networks, word processing and other software applications, ability to upload and download files, use of the World Wide Web and email, accessing online libraries and other resource databases, and experience with online forums and other discussion applications, the more ready they are to take an online course. Other foundational requirements include access to a stable Internet connection and dependable computer and printer.

Learning skills: Readiness is fortified by the ability to work independently, be self-moivated, possess mature reading and writing skills, and a proactive approach to learning, and a positive attitude.

Time management skills: Readiness is evident when a learner can safely plan blocks of time for participation and study within their existing lifestyle and commitments. Managing one's time in order to complete an online course requires a respectable level of commitment and discipline.

Recommended online tools for gauging e-learning readiness

There are some excellent free online tools available for students to use (and design teams to examine) in gauging readiness for e-learning. Three highly recommended ones include:

- Novosel, S. (2000). *Readiness Index for Learning Online (RILO).* Indiana University School of Nursing. http://nursing.iupui.edu/About/default.asp?/About/CTLL/Online/RILO.htm
- Schrum, L. (2001). *SORT: Student Online Readiness Tool.* University of Georgia. http://www.alt.usg.edu/sort/
- DeSantis, C. (2002). *eLearners Advisor.* University of Guelph. http://www.elearnersadvisor.com

How does e-teaching style affect design?

The design team needs to consider the teaching styles promoted by the philosophy of the institution, the styles exhibited by the program's instructors, and expert knowledge about effective and empowering e-learning and e-teaching theory. Grasha (2002) identified several categories of teaching styles that are relenant when planning online courses. Characteristics of Grasha's teaching style model are summarized in Table 13.6.

GRASHA'S TEACHING STYLE CHARACTERISTICS

Table 13.6 provides some general considerations for the design of the course environment. Interactivity capabilities are important; the means to give immediate feedback and foster both group and individual interaction and dialogue are also critical to effective teaching; as is the ability for creative and appealing organization of course content. Dynamism can be supported with the inclusion of multimedia and other multi-sensory content. Discussion functions such as forums, journals, chat-rooms and group work areas all need to be robust, reliable, easily accessible, and seamless to support spontaneous as well as planned interaction activities.

Table 13.6. Teacher style characteristics (adapted from Grasha, 2002, p. 24)

CHARACTERISTIC	DEFINITION
Analytic/Synthetic Approach	The ability to present and discuss theoretical issues and new discoveries from a wide-scope perspective, addressing a variety of views; and contrasting implications of a variety of theories
Organization and Clarity	Course objectives and organization is clear, materials are well-prepared and learner-friendly
Teacher—Group Interaction	Discussions and mutual sharing of ideas are supported within the learning environment
Teacher—Individual Learner Interaction	Teacher is approachable and accessible; lines of communication are seamless and can occur at the learner's discretion; good feedback mechanisms in place
Dynamism and Enthusiasm	Degree that the teaching is energetic, stimulating, enjoyable
General Teaching Ability	Teacher's expertise, consistency, adaptability
Overload	Amount of assigned course work, level of difficulty
Structure	Ability to plan lesson details, organize course within milieu
Quality	Expectations for learner work quality and performance
Learner—Teacher Rapport	Nature and quality of interactions; interactivity level of online milieu

Grasha (2002) also identified four psychological temperaments that teachers exhibit, which are loosely based on Carl Jung's (1971) work These four temperaments are summarized in Table 13.7. Again, the design team can ensure that all temperaments are supported within the course design.

The four temperaments mentioned in Table 13.7 culminate in being expressed within five teaching styles, according to Grasha (2002). These styles include the expert, formal authority, personal model, facilitator, and delegator (see Table 13.8 for more detail on how the design team can facilitate the teaching styles of the future instructors who will teach the course.

Table 13.7. Teacher psychological temperament and course design (adapted from Grasha, 2002, pp. 44–45)

Teacher Psychological Temperament	Design Considerations
Dionysian: Sensation-Perception (SP)	Enable group projects, demonstrations, games, multimedia, practical quizzes and tests, spontaneous action, proactive interactivity, chatrooms, forums, journals, seamless emails
Epimethean: Sensation-Judging (SJ)	Enable lecture/text areas, demonstrations, tests and quizzes, high organization, needs structure and control, prefers record of learner activity, outcomes, methodical, Socratic dialogue
Promethean: Intuitive-Thinking (NT)	Promote learner independence, individual projects, reports, high standards and mechanisms for giving formal feedback
Apollonian: Intuitive-Feeling (NF)	Enable small and large group projects, discussions, simulations, self discovery learning experiences, spontaneous personable interaction with learners, workshops, emotional values-focused expression

Table 13.8. Grasha's (2002) teaching styles and design team considerations

Teaching Style	Design Considerations
Expert	Interesting information transmittal venues, robust resources for learning, high standards
Formal Authority	Feedback mechanisms important, high organization and structure, formal evaluation
Personal Model	Stimulating, multi-sensory milieu, spontaneity, demonstrations, observation, simulations
Facilitator	Personable interaction, support learner independence, Group Project work, Flexibility
Delegator	Empowers learner autonomy, independent projects, spontaneous interaction

CONSTRUCTIVIST APPROACHES TO DESIGN DECISIONS

Current educational literature purports that a constructivist approach to e-teaching is recommended in order to meet the needs of 21st century learners (Sims, 2006). "Constructivist epistemology assumes that learners construct their own knowledge on the basis of interaction with their environment. Four epistemological assumptions are at the heart of what we refer to as "constructivist learning":

- "Knowledge is physically constructed by learners who are involved in active learning.

- Knowledge is symbolically constructed by learners who are making their own representations of action.
- Knowledge is socially constructed by learners who convey their meaning making to others.
- Knowledge is theoretically constructed by learners who try to explain things they don't completely understand" (Gagnon and Colley, 2001, p. 1)

Colon et al. (2000, p. 9) described how constructivist instructional design can be applied to support this style of teaching and learning. The authors outlined the fundamental creation tasks of the course design:

- **surface characteristics**—screen layout, typography, language, graphics, illustrations, sound;
- **interface**—look and feel, user interaction, help, support, navigation, metaphors;
- **scenario**—sequence of video cases, options/choices, comparisons;
- **supporting hypertext and hypermedia instructional content**;
- **instructional strategies—"chunking**" of content.

It can be concluded that both e-learning and e-teaching styles are important considerations for the design team to keep in mind as they collaborate to plan the course creation. This is facilitated through attending to the structure and organization of the course content and environment—in other words, in the packaging.

How important is the packaging?

> "Imitating paper on a computer screen is like tearing the wings off a 747 and using it as a bus on the highway." (Ted Nelson, 1999)

The final step of the planning process is a fundamental and critical one: choosing the packaging of the course. There are a variety of elements that are important in this process including the general content structure, sequence, flow, and pacing. Presentation structure is also important, and includes considerations such as the tone and mood projected in the text and 'feel' of the site, including the coherence, consistency, navigation, aesthetic use of colours and graphics, and the text fonts used in the overall course site interface. The important components are discussed in the following section.

UNITS OF STUDY

A uniform approach to presenting the units of study not only makes sense, but helps reinforce learning. A common mode of organization is a hierarchical *module—sections—lessons—supportive activities* approach. Within each learning activity, uniformity also helps to guide students through the content. One easy way to organize the units is from general to specific, beginning with units focused on basic principles then working up to unique and specific content topics. For example, a course on research design might begin with units focused on the general research process, literature searches and the like, then move on to specific research design processes such as experimental quantitative design or phenomenological qualitative methods.

STRUCTURE

A consistent structure should be used to present the units of study. Information, help, resource, and other sections need to be positioned in the same area of the page, across screens and sections. The generous use of white space helps to keep this structure accessible and visually appealing for the learners. The learning activities should also have a consistent structure. One common method is to use a lesson template including such headings as *Overview, Objectives, In Preparation, Class and Individual Activities, Reflection, Enrichment Activities or Resources, and References.*

The back-end structure that supports the learner environment should be carefully thought out as well. Folders or databases are needed for each group or cluster of files. A common practice is to group all images in an image database or folder; all multimedia in a multimedia database or folder; all audio in a separate folder, and so on. This not only helps the instructor find necessary components, but also facilitates upgrades and editing, and facilitates downloading and uploading of files from the course website.

SEQUENCE

A plan to present all content and activities in a sequential flow is important to ensure learners have instant access to current and archived content, and do not miss critical pieces. Sequencing would follow the units of study and structure determined beforehand, moving from general to specific. This sequencing is best viewed as a specific menu or site map, where students can get a view of the entire course content on one screen.

FLOW

Flow is achieved by presenting the sequential content in an intuitive yet logical manner. It is also boosted by clear, consistent navigation and positioning of screen elements. The learner should immediately know where to go next, without confusion or resorting to trial and error clicking on various navigation buttons or titles.

PACING

It is best to keep the text areas small, so that the course content is presented in chunks, limiting the amount of text that is presented on each screen. Short lines of 40 to 60 characters each are best. The use of tables, charts, bulleted lists, and other organizers help to increase the visible appeal and reinforce learning. If possible, avoid long vertical scrolling pages; at all costs.

TONE

The design team should find ways to present help files, course content, and other textual prompts using an active voice, second person, present tense and a conversational tone in the course design. Language should be concise and consistent. It is also best to avoid language and examples that will inhibit the "shelf-life" of the site, such as "Now in 2008 …".

COHERENCE

The design team should ensure that the layout of each screen is clear, pleasing to the eye, and conforms to the Western text layout of left-to-right, top-to-bottom text standards, since this is how learners usually read. It can be very confusing if their eyes need to dart all over the screen to understand what is before them: this can cause both dissonance and confusion.

CONSISTENCY

It is important to keep the general layout design of the course screens consistent in size, structure, colour, placement of elements and font usage. It is also important to make sure that the appearance and utility of the site is consistent across browsers (e.g., the site should look and act the same in Internet Explorer and Firefox). Efforts should be made to facilitate download and screen loading times across Internet access modes, including broadband and dial-up access. This means keeping the size of graphic, audio, multimedia, and text files compact and reasonable in size, and optimized for quick loading and downloading. As well, learners should be able to upload files to the course area within a few seconds, and without crashing their systems or freezing the web browser screen.

NAVIGATION

Navigation online is like the nervous system of the human body. It connects all of the course elements, allowing movement and flow as the learners explore the course. The key to designing navigation is to pick one uniform method, and stick to it consistently throughout the course site. Navigation can be as simple as a set of uniform buttons placed strategically in the same place on every page. Or it can consist of Java based panels or animated Flash "hot spots" on an image map.

Graphical menus and navigational elements help to intuitively guide the learner through the course online environment. It is best to plan the navigation to give the learner control over what sections they can select for navigation but to also provide a "road map" with suggested navigation sequences. Navigational linked sections should somehow be distinguishable from static non-linked portions of the site (for instance, use a different colour, specific icons, underlining, or roll-over text changes). Consistency in navigation is important to reduce learner frustration and to maximize the learning experience. Navigation buttons should be clearly labelled, consistent across pages, and easy to view and access.

COLOUR

> "Color is born of the interpenetration of light and dark". (Sam Francis, 2003)

Colour is an important feature of effective course design. First off, it is best to choose colours that are included in the 216-colour cross-browser platform colour palette. Although this precaution is becoming less critical, since the majority of modern computers will support millions of colours, it is safe to stick to this rule to ensure that the learners will be able to access the general 256 colour palette common on most computers made within the past ten years or so.

Colours on the Web are always a mixture of R (Red), G (Green) and B (Blue). The R or G or B value can range from 0 to 255, with 0 meaning the colour value (e.g., the R) is off, and 255 meaning the value is fully on. Every screen colour has a value that tells the designer how much of the R, G, and B is showing or absent. In website development, red, green, and blue values are written as six-digit hexadecimal coding: a combination of numbers from 0 to 9 and letters from A to F. For example, pure blue has a hexadecimal value of 0000FF, and so on. To ensure that the colours are visible as intended, it is wise to stick to the web-safe palette of hues. This is because browser-safe colours don't *dither*. Dithering is what happens when a colour is not available in the web palette, so the browser tries to compensate by combining pixels of other colours to substitute. Dithered colours look rough and spotty: browser-safe colours stay smooth and even looking.

Colour is also a very important consideration to set the mood, tone, and visual appeal of a course site learner interface. If it is possible to customize the colour scheme for each course, spend time as a team to visualize the landscape or metaphor that is suggested by the course content. For instance, a general biology course might suggest the use of greens offset with browns and white; while a course on metaphysics might suggest the use of purples, lilacs, rich blues offset with white. If you want to wake up your learner audience, to initiate action or stimulate emotions, a warm colour scheme works best. Reds, oranges, yellows all do the trick. If your intended mood is one of calm, leisure, or dignified refinement, use cooler colours—blues, purples, greens. If your statement is bold and to the point, sharp contrasting colours such as black and white or blue and orange work well.

Basic colour theory

Colour theory focuses on how colour manifests on the spectrum. Colour psychology goes one step further to assign common meaning or moods to specific colours. To apply these to the course design, the team should explore the meaning of primary, secondary and tertiary colours which are the most common colours used on the World Wide Web. Figure 13.9 illustrates the 12 basic colours of the colour wheel.

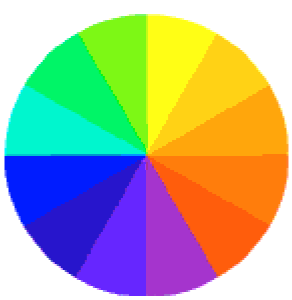

Figure 13.9. The colour wheel

Primary colours are the three pigment colours that cannot be mixed or formed by any combination of other colours. All other colours are derived from these three: red, blue and yellow. Each of these pure colours stir up different moods and feelings in a viewer. Figure 13.10 illustrates the primary colours.

- **Red—**hot, fire, daring, lush, aggressive, power, excitement, dominating, warning.
- **Blue—**peaceful, water, calm, wisdom, trust, loyalty, dedication, productivity.
- **Yellow—**happy, sunny, cheerful, alert, concentration, bright, warm, creative, playful.

Figure 13.10. The primary colours

Secondary colours are formed by mixing two of the primary colours together. These mixed colours also evoke particular moods. Figure 13.11 illustrates the secondary colours from the mixture of two primary colours.

- **Green (blue and yellow)**—pastoral, spring, fertility, jealousy, novice, youth, hope, life, money
- **Orange (red and yellow)**—warm, autumn, generous, strong, fruitful, appetizing
- **Purple (red and blue)**—royal, mysterious, pride, luxury, wealth, sophistication

Figure 13.11. The secondary colours

Tertiary colours are formed by mixing the secondary colours with primary colours. The olour wheel, illustrated in Figure 13.9 gives examples of the six tertiary colours between the three primary and three secondary colours.

- Yellow-orange
- Red-orange
- Red-purple
- Blue-purple
- Blue-green
- Yellow-green

Analogous colours are any three colours which are side by side on a 12-part colour wheel. **Complementary colours** are any two colours which are directly opposite each other, such as red and green.

Of course there are also **black and white,** both very common colours used in course designs.

Figure 13.12. Black, white and gray

Black is the absence of red, blue, and green light while white is the purest saturation of all three. Black and white plus gray are known as non-chromatic hues.

- **Black** represents style, dark, mystery, formal, powerful, authority.
- **White** is clean, pure, chastity, innocence, cool, refreshing.
- **Gray** is neutral, conservative, formal colour. Gray ranges from sophisticated charcoal gray to active, energizing silver. It also represents maturity, dependability, and security.

FONTS

Finally, text fonts and embellishments can be used to help improve the comprehensiveness, presentation and accessibility of the content. Use a consistent font (common ones include two sans serif fonts: Arial and Verdana, and two serif fonts, Times New Roman and Georgia) throughout the text. Figure 13.14 shows examples of these four common fonts. Use bold and italic embellishments for emphasis. Only use underlines for actual links. Avoid using all capital letters. A good rule of thumb is to use size 11 for general text font, 14 for subheadings, 16 for titles. It is best to avoid blinking text, as this can produce eye fatigue and may annoy the learners. As well, graphical dingbat fonts can be used to create icons, and other supportive graphics (Figure 13.13).

Figure 13.13. Examples of dingbat font images created using the Wingding *font.*

This is an example of Arial 18 point font

This is an example of Verdana 18 point font

This is an example of Times New Roman 18 point font

This is an example of Georgia 18 point font

Figure 13.14. Examples of Arial, Verdana, Times New Roman and Georgia text fonts

Summary

> "Step back … Before you get started putting your course online, you will want to take a step back to examine the big picture of what it is you want to do". (Elbaum et al., 2002)

Planning an online course involves identifying and communicating the preliminary considerations that will guide course design and implementation. At the core, planning requires an examination of individual circumstances, philosophies, and skills. There is no single course planning worksheet that will suit all design projects.

This chapter began with an overview of how the planning process is influenced by context and trends. There is a continuum of design approaches ranging from flexible to linear, and emerging opinions about how our learning spaces should be shaped. Although learning-centred design is commonly acknowledged as central to the success of online courses, and a team of individuals with specific areas of expertise is ideal for effective design, in reality there are often gaps in the necessary resources, skills and knowledge to accomplish everything we need or want to do.

Certain learner characteristics can often be identified early on in the design process, but this is not always the case. Age, socio-cultural backgrounds, and lifestyles of the audience are all important considerations for course design. E-learning offers more opportunities to cater to individual learning styles by combining text and multimedia, planning for exploration, and designing activities to engage learners in a variety of ways.

Likewise, e-teaching style influences design, yet this is another element that can be unknown during the planning stage. An awareness of the general teaching style characteristics and how they influence practice will help to guide the design process.

Communicating our course design plans using mapping tools can serve to identify the important components and relationships among them. Visually organizing design ideas in this manner is particularly suitable for online courses because it can translate well into a website design. Different types of mapping tools can support the various design approaches, some being more linear than others.

The final step of the planning process, the packaging, is a culmination of all steps. Presentation, pacing, flow, and general look and feel of the course is informed by educational philosophies and beliefs of the design team, the audience, teaching and learning styles, and a preliminary sketch or map of course components and the relationships among those components in terms of time and space. There are also some important web design principles to follow.

Practice tells us that there are many different ways to approach online course design. It is easy to be swept away by the plethora of technologies available to designers but an important reminder to conclude this chapter is to keep the focus on learning. Take the time to understand the *why* of your course plan, and how much of the *design* should precede implementation.

Glossary

Chat room. Text-based real-time group communication where multiple users type their questions, answers, viewpoints and ideas for everyone to see.

Chunking. The process of organizing learning materials into brief sections to improve learner comprehension and retention.

Concept map. When used for course planning, a concept map is a visual representation of the components and elements of the planned course, also referred to as a course map or flow-chart.

Connectivism. Described as a learning theory for the digital age, connectivism considers the influence of learning tools in explaining how we learn.

Constructivist. The assumption that learners construct their own knowledge on the basis of interaction with their environment.

E-learning style. An individual learner's unique approach to learning within the online environment, based on strengths, weaknesses, and preferences. Examples are numerous; well-applied ones include Gardner's Multiple Intelligences and Kolb's Learning Styles Inventory.

Flexible approach. An instructional design strategy which is adaptable and learner-centred.

Interactivity. A technological feature that supports the learner and teacher to engage in something that helps to maintain learner interest, provide a means of practice and reinforcement. Examples are engaging in dialogue using a forum, journal or **chat room**; providing peer feedback using a form format; verbal discussion using microphone and speaker programs; visual prompts that encourage student clicking and choosing sections of a screen.

Module. An integrated "theme" of content. Typically, one component of a course or a curriculum.

Multimedia. The integration of various media, including text, graphics, audio, video and animation, in one e-learning application.

Readiness. The level of willingness and motivation in a learner in regards to selecting e-learning as a mode of education. This includes computer skill level and experiential knowledge with online learning.

Real-time. Instantaneous response or experience with learning event. Examples include real-time simulation or chats that follow the pace of events in reality.

Storyboard. A visual scripting tool made up of a collection of frames created by a multimedia, graphic, video, or instructional developer that details the sequence of scenes or module components that will be represented to the users (instructors and learners).

Systems approach. An instructional design strategy that follows a linear model similar to project management. A decision to use a systems approach is usually influenced by the size of the project.

Quotes to ponder

- "The most powerful designs are always the result of a continuous process of simplification and refinement". – Kevin Mullet and Darrel Sano (1995)
- "There is no such thing as a boring project. There are only boring executions". – Irene Etzkorn, axiom (n.d.)
- "Technical skill is mastery of complexity, while creativity is mastery of simplicity". – E. Christopher Zeeman, Catastrophe Theory (1977)
- "Creativity involves breaking out of established patterns in order to look at things in a different way". – Edward de Bono, 2005, debonoblog.com
- "Quality isn't something you lay on top of subjects and objects like tinsel on a Christmas tree". – Robert Pirsig, *Zen and the Art of Motorcycle Maintenance: An Inquiry into Values* (1974)
- "Absolute certainty about the fail-proofness of a design can never be attained, for we can never be certain that we have been exhaustive in asking questions about its future". – Henry Petroski, *Design Paradigms: case histories of error and judgment in engineering*, New York, NY: Cambridge University Press. (1992)
- "A specification, design, procedure, or test plan that will not fit on one page of 8.5-by-11 inch paper can-

not be understood". – Mark Ardis Comparison of algebraic and state-machine specification methods. In Proceedings of ISPW, 1985. pp. 101–105 (1985)

- "Everyone designs who devises courses of action aimed at changing existing situations into preferred ones". – Herbert Simon, The Sciences of the Artificial (3rd ed.). Cambridge, MA: MIT Press. (1996)
- "Tell me, and I'll forget. Show me, and I may remember. Involve me, and I'll understand". – Chinese proverb
- "Someday, in the distant future, our grandchildren's grandchildren will develop a new equivalent of our classrooms. They will spend many hours in front of boxes with fires glowing within. May they have the wisdom to know the difference between light and knowledge". – Plato
- "X-Generations demand X-cellent training in an X-celerated speed". – Angel Rampy (2006) http://www.coachangel.com/
- "The 'e' in e-learning stands for experience". – Elliott Masie, Masie Center (n.d.) http://www.masieweb.com/
- "Communications is human nature. Knowledge sharing is human nurture". – Alison Tucker, Buckman Laboratories (n.d.)
- "Online learning is not the next big thing, it is the now big thing". – Donna J Abernathy, Distance Learning: Reach Out And Teach Someone, Training and Development Magazine, 52(4), 49–50 (1998).

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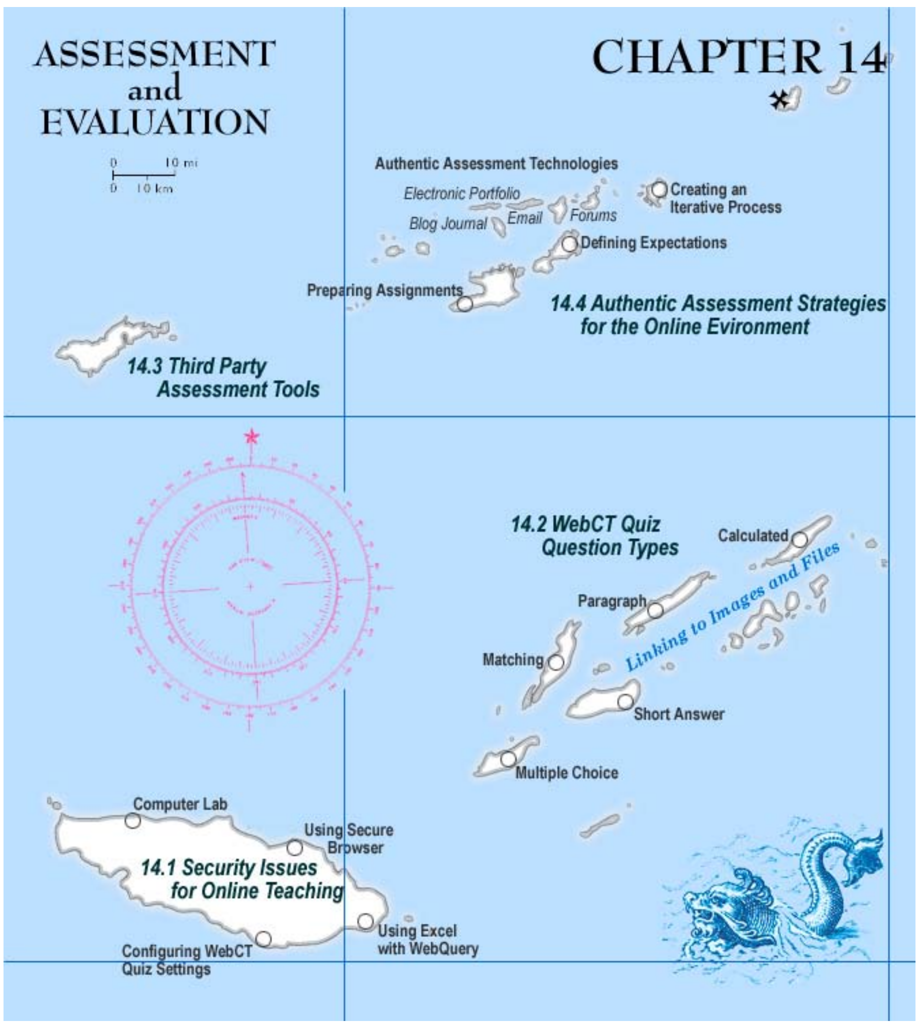
14
Assessment and Evaluation

Dan O'Reilly and Kevin Kelly

To improve learning and promote learning communities, we must recognize that successful assessment is not primarily a question of technical skill but rather you of human will. – Angelo (1999)



Learning outcomes

After completing this chapter, you will be aware of:

- issues relevant to setting up a computer lab for online testing.
- software configuration issues relevant to online testing.
- security issues relevant to online testing.
- various types of software available to manage quizzes in a lab setting.
- the various types of quizzes that can be delivered online.
- some advanced features available for use in WebCT quizzes: JavaScript, Excel WebQuery, RegularExpression, etc.
- student assessment strategies for the online environment.

Introduction

This chapter reviews some of the basic issues of evaluation and assessment relevant to online testing. The chapter primarily uses as example WebCT version 4.1; nonetheless, the examples are such that they can be applied to most online platforms used in a lab setting.

The chapter begins by detailing some of the more important security issues for online testing, ones that generally are not covered in most reference material. It looks in detail at some third-party software, namely, NetSupport and Excel, for managing computer labs. NetSupport provides a means of monitoring every computer in a lab from you workstation; Excel, through its web query function, provides a means of collecting data from any page in WebCT in order to monitor activity on that page. Detailed examples are provided for both packages. The quiz settings relevant to monitoring a WebCT quiz in a computer lab are discussed in detail. Here, the discussion focuses on WebCT 4.1 and a computer lab environment.

The chapter next gives a detail examination of the WebCT quiz environment and the different types of WebCT quizzes: multiple choice, matching, short answer, paragraph and calculated. It assumes that the reader has basic knowledge to create a quiz, and rather than providing such information it discusses some advanced features available both within the WebCT settings for quizzes and also features available externally to modify the quiz environment. Such things as using JavaScript pop-up windows for creating links to external information within a quiz; using and creating Regular Expression scripts to edit input at the quiz interface; using HTML tables to control the display in a WebCT calculated type of question; etc. Detail examples are provided for each, with suggestions for using an HTML editor such as Dreamweaver.

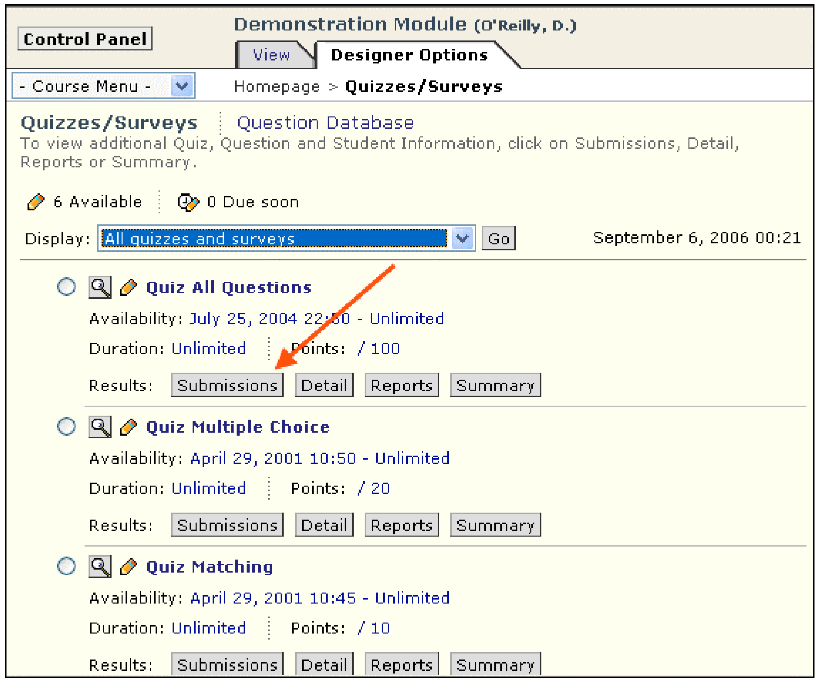
Security issues for online testing

by Dan O'Reilly

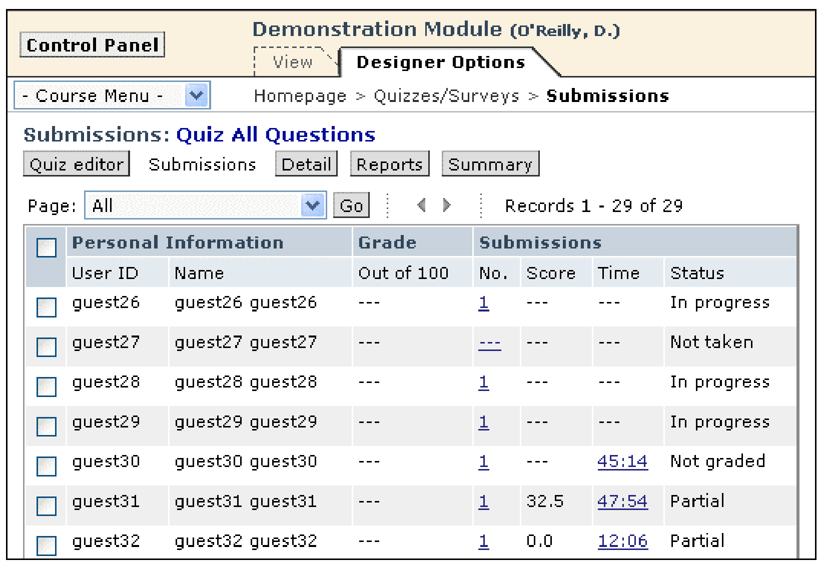
SECURITY ISSUES IN A COMPUTER LAB SETTING

In this section, I focus on the WebCT CE 4.x Quiz Tool and on issues related to administering a closed-book quiz/exam in a computer lab. I do not cover all issues of setting-up and running a WebCT quiz in a computer lab, I only consider certain security issues not covered in most reference material on WebCT. As well, even though you may use a different platform than WebCT, many of the issues discussed here are similar for most of the learning management systems (LMSs). In the following discussion it is assumed that the person monitoring the quiz/exam has access to a computer workstation in the lab.

You can identify those who have signed into a WebCT quiz through the Submissions page. To open the submissions page, go to the Quizzes/Surveys page and click Submissions.



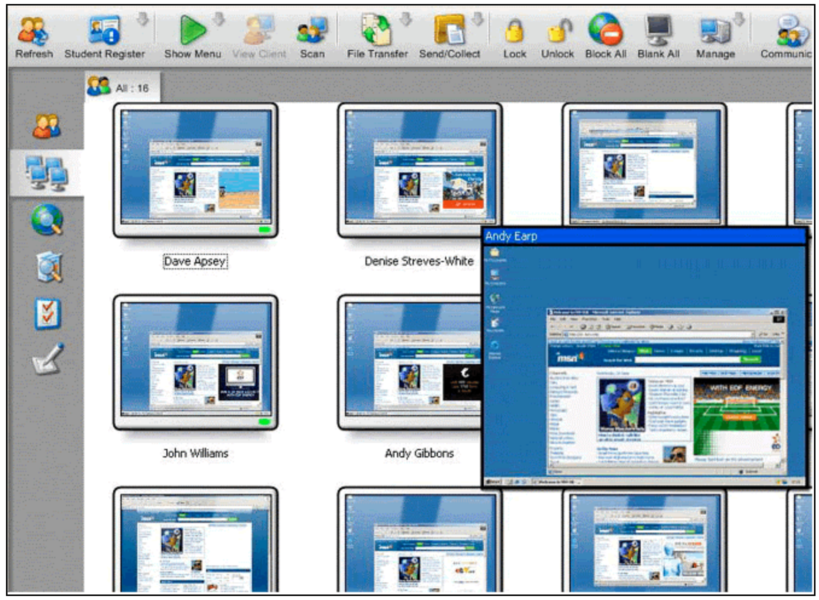
The link to Submissions displays all student accounts in the course, as well as identifying those who have started or completed the quiz.



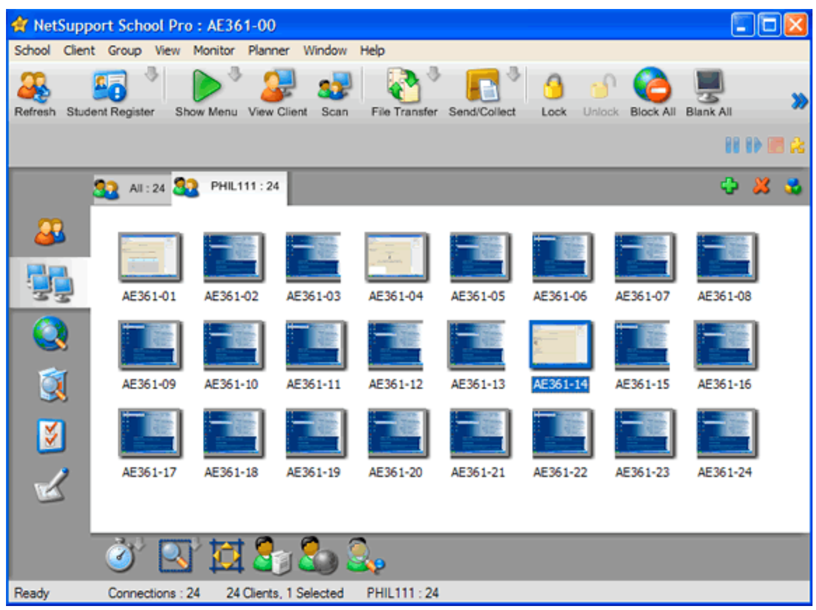
The Submissions page provides a wealth of information about a quiz. The page informs the instructor if the quiz is “In progress”, “Not taken”, “Not graded”, or “Partial”. The first two labels are self-explanatory. The last label means that some of the questions in the quiz are not marked. This happens when there are machine gradable questions mixed with short answer or paragraph type questions. The latter question types must be manually marked by a human. The “Not graded” label means that the student either quit the quiz without properly submitting the quiz for grading or the designer configured the quiz so that it either must be manually graded or it must be manually submitted for grading. Clicking a Submissions no. opens the quiz of any student, whether submitted or not. In WebCT, you can view the quiz while it is being completed by the student, before it is even submitted. In fact, the designer can force the quiz to be submitted while it is still being completed, so be careful when accessing live quizzes.

Though the Submissions view does provide information about a quiz, and allows some monitoring of the quiz environment, computer labs should also be equipped with either a secure browser or computer monitoring software such as NetSupport to protect the security of the quiz environment. Preferably a lab would have both features; neither by itself ensures absolute security. Together, these tools give a high level of security. Nevertheless, even if both these security tools are implemented, you should still consider restricting the IP address of work stations (more on this below in the Quiz Settings).

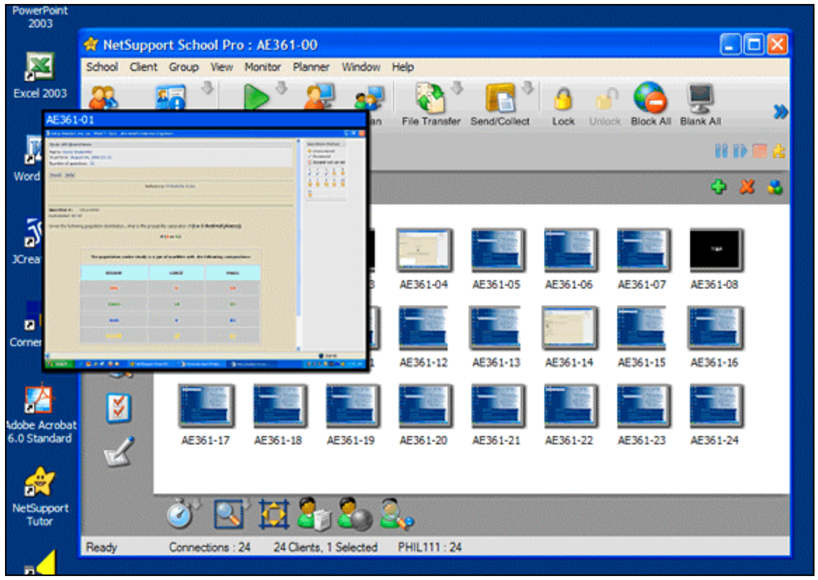
A program like NetSupport (the following is a screen shot from the NetSupport website http://www.netsupportschool.com/quality.htm) allows an instructor to visually monitor all computer screens during a quiz, and this can assist in identifying if a student is viewing a practice set of questions (with answers) during the closed book quiz or even emailing a friend for assistance.



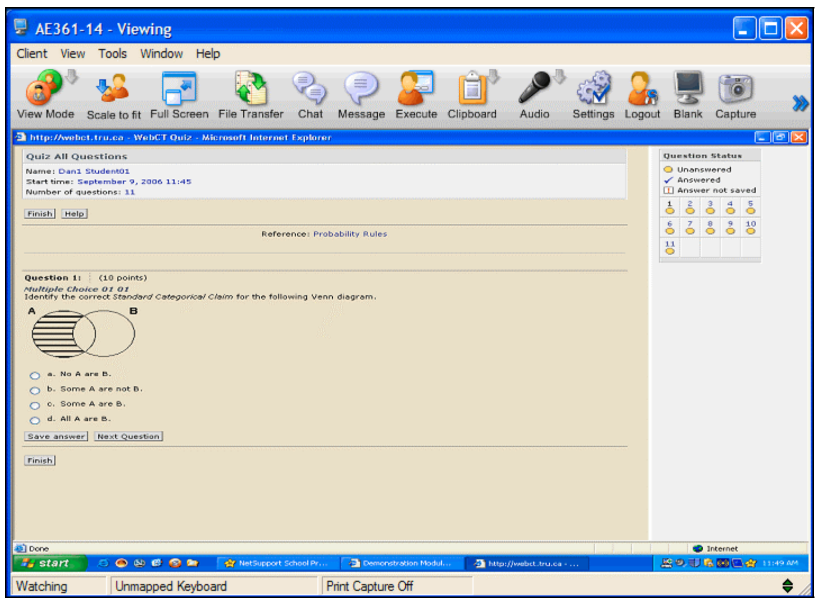
When using NetSupport with WebCT you would see something like the screen shown here.



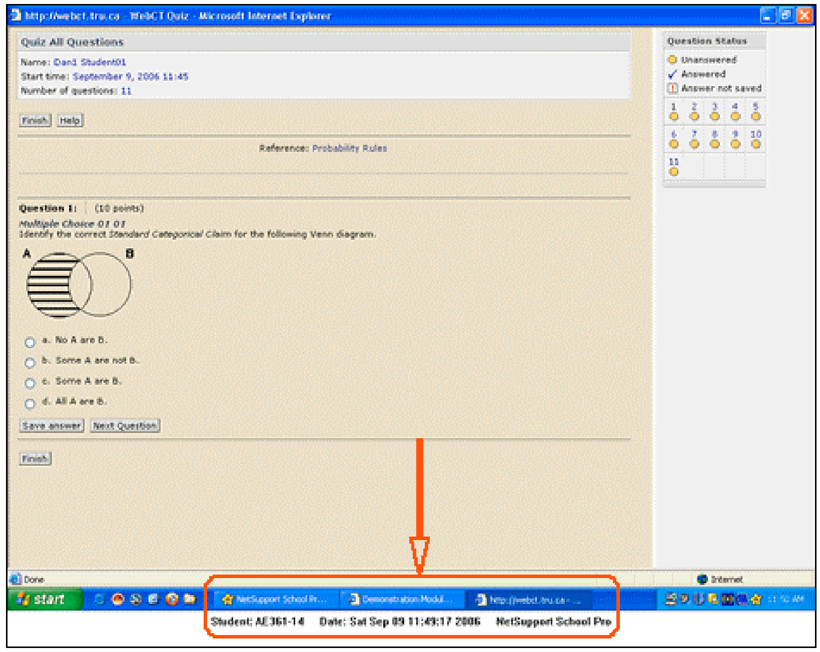
NetSupport provides a view of all of the computers in the lab. It also allows you to mouse-over a station icon, which pops-up a magnified window of a student workstation (this is a view in a Thompson Rivers University lab).



If the NetSupport view raises suspicion of wrongdoing, you can force the suspicious workstation to expand to the full size of the monitoring workstation.

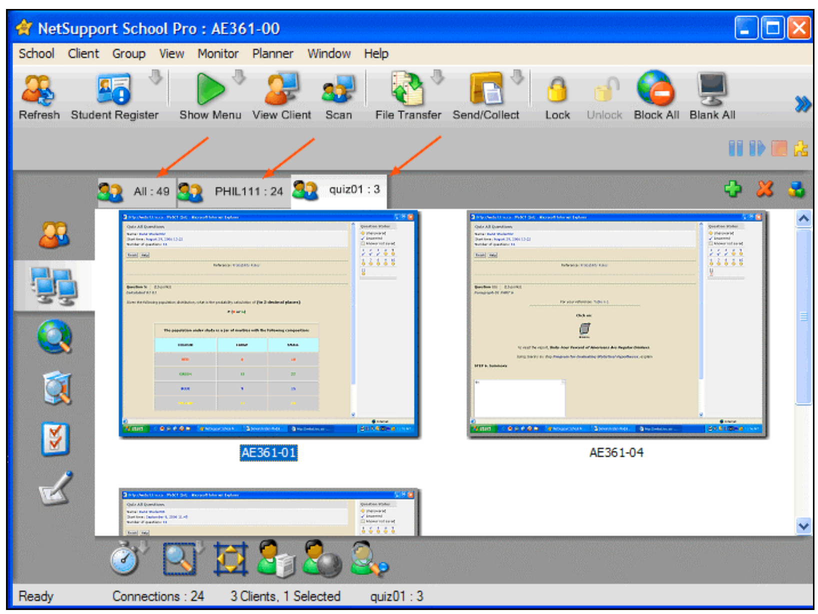


And you can identify all programs the student has activated in the background by viewing the task bar of that workstation.



As well, by setting your quizzes a certain colour it is easy to spot workstations that are accessing material that is not part of the quiz. You can do a screen capture of any suspicious workstation, to act as evidence of violation of the rules of the exam setting.

You can also increase the magnification of the collective class screen. The following demonstrates that it is possible to create other views of the workstations in the lab, which are easy to tab between. You can create a tabbed view of all workstations, of the workstations for only the class, or of the workstations that are only doing the quiz (I frequently allow other students in the lab who are not completing the quiz). The fewer the number of stations monitored the greater the magnification possible to view all stations at once.



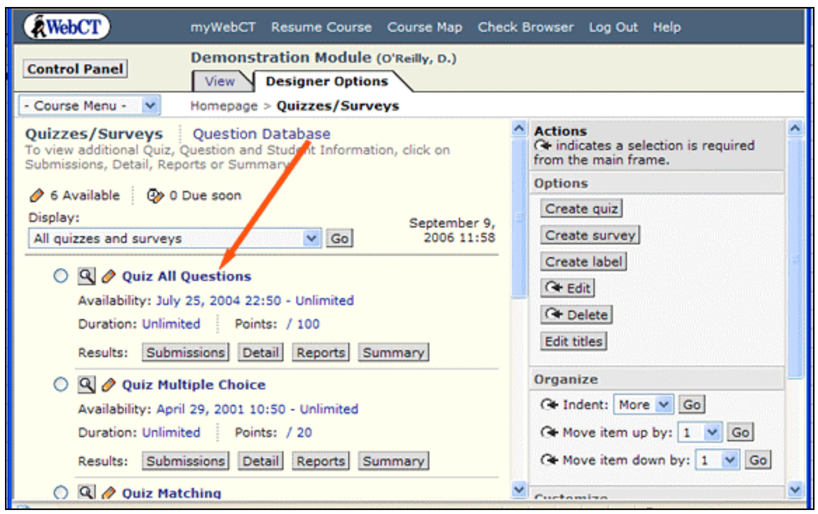
USING A SECURE BROWSER

A secure browser can be configured to only allow authorized programs during the quiz. For example, Respondus LockDown Browser (http://www.respondus.com/) is a custom browser that locks down the testing environment within WebCT. Students then are unable to print, copy, go to another URL, or access other applications during the quiz. When an assessment is started, students are locked into it until they submit it for grading. Though secure browsers provide a significant degree of security, it is still worthwhile viewing each individual station with a program like NetSupport. NetSupport also provides similar features to the Respondus LockDown Browser. Check out their respective Websites for further details. As well, if possible, restrict IP addresses (more on this below).

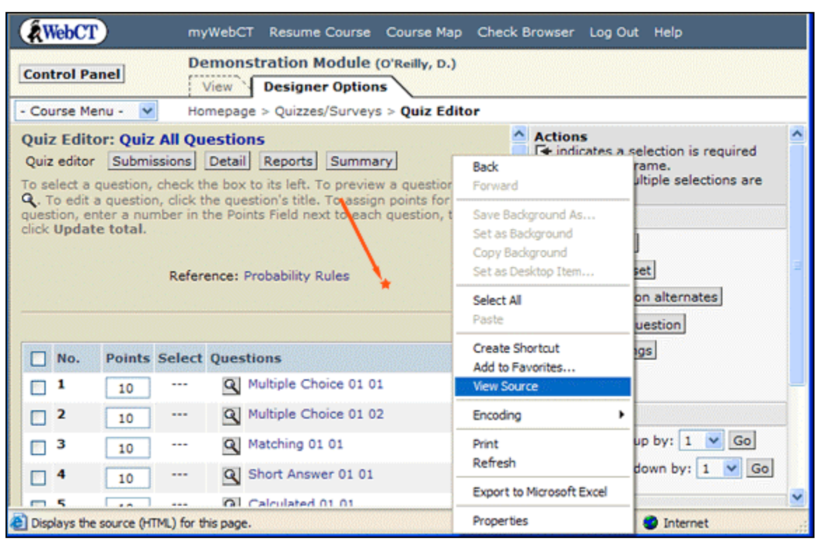
USING EXCEL WITH WEBQUERY

I have up to 200 students registered in a WebCT course. Even though the class breaks down into 24 students per lab/quiz, which is quite manageable, the Submissions screen does not provide an easy way to isolate the specific 24 students taking a quiz; you must view all 200 student accounts at once. It is very difficult to monitor the 24 students taking a quiz when the Submissions screen lists 200, and the 24 are scattered throughout the 200. This is especially a problem if students are assigned to the labs non-alphabetically (the Submissions screen sorts students alphabetically by Last Name only). However, you can use the WebQuery feature of an Excel spreadsheet to assist in the monitoring. All data on any WebCT page can be grabbed by an Excel WebQuery.

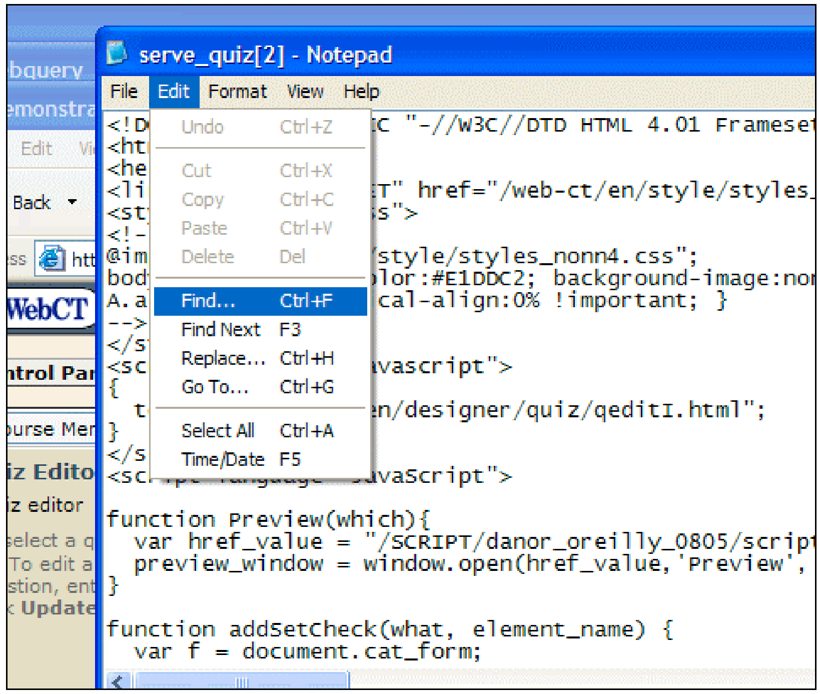
To prepare for using WebQuery, you must enter the WebCT URL of your Submissions page. To identify that address, open your WebCT Quizzes/Survey page from the designer account. Then click on the link to the quiz.



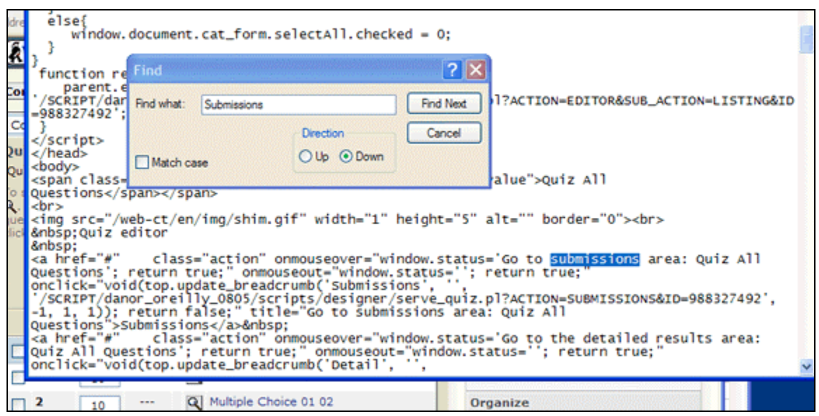
This opens the Quiz Editor for that quiz. Pull your mouse over the background of the quiz page (anywhere but a hypertext link), and right click (this assumes you are using a PC). In IE, a pop-up window appears. Select, View Source.



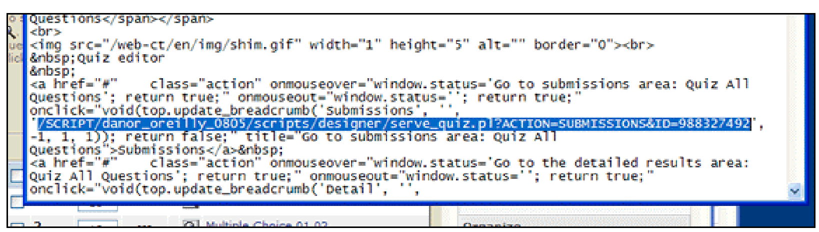
This opens a Notepad window of the source HTML code for that page. Make sure your Notepad is in Word Wrap mode. Click on Edit > Find.



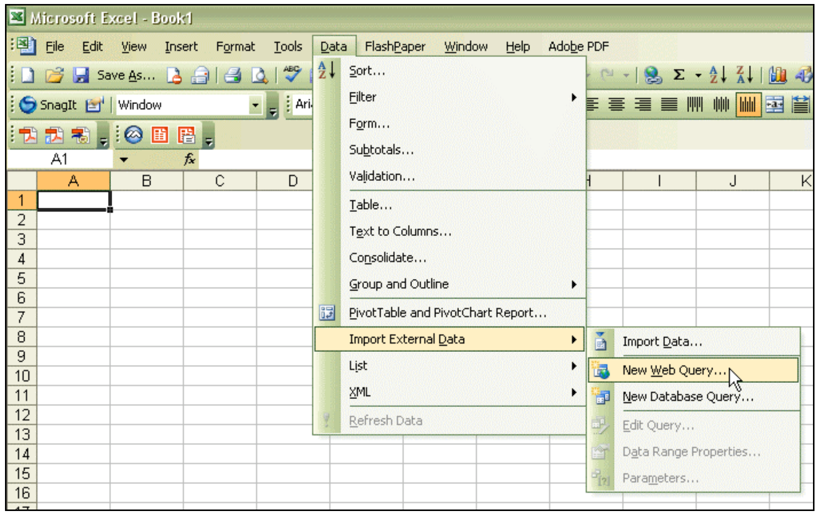
Type “Submissions” into the find field and click “Find Next” until you find the anchor link for ‘Submissions’ (code with a “<a href” included).



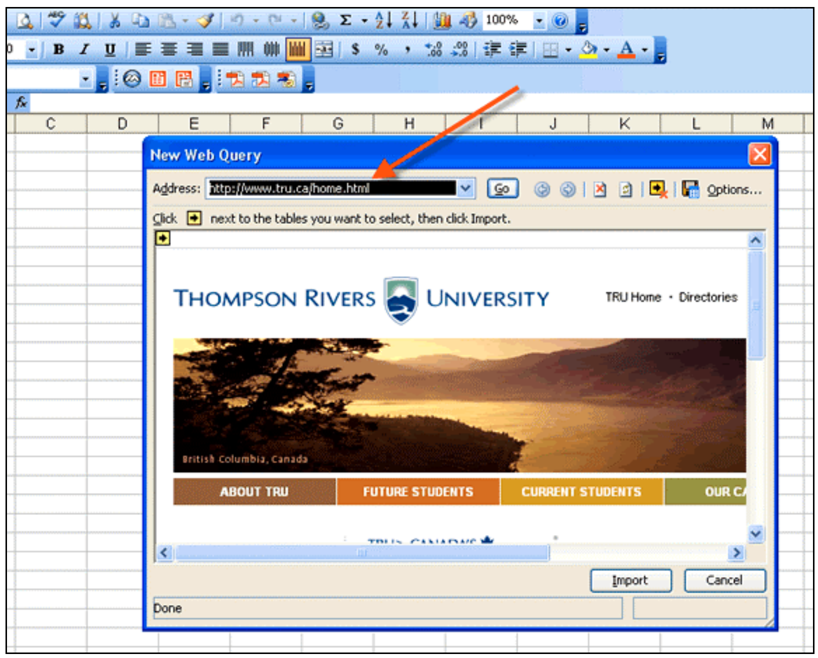
Just ahead of this location is the required URL. Copy and save that address, it is the Submission Page URL. You require this address for the WebQuery which follows.



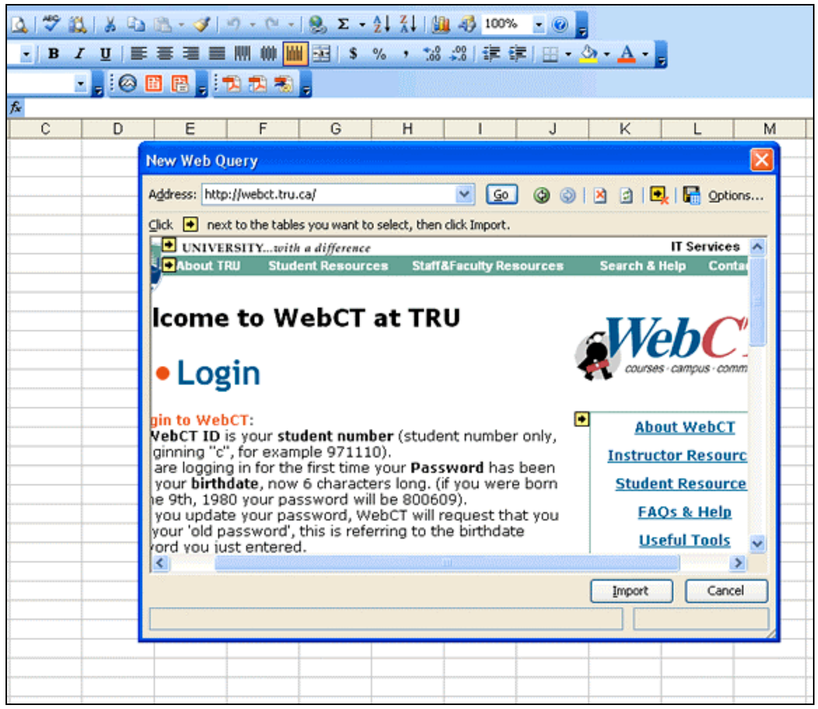
To execute a WebQuery, open an Excel spreadsheet, click Data > Import External Data > New Web Query (I assume some working knowledge of Excel and I am only sketching out the process here because specifics can vary from system to system).



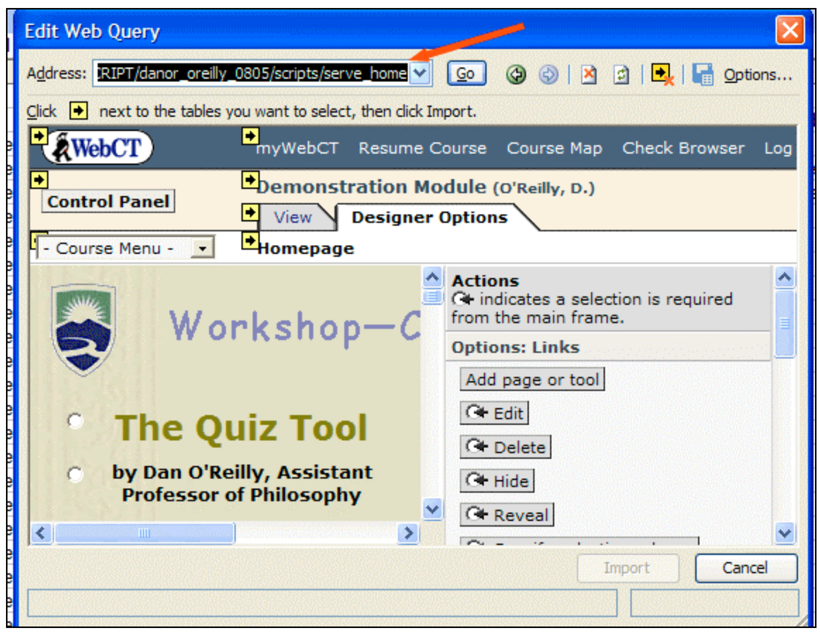
This opens a window in your spreadsheet, which initially displays your default browser Homepage. Enter the location of your WebCT server in the address field.



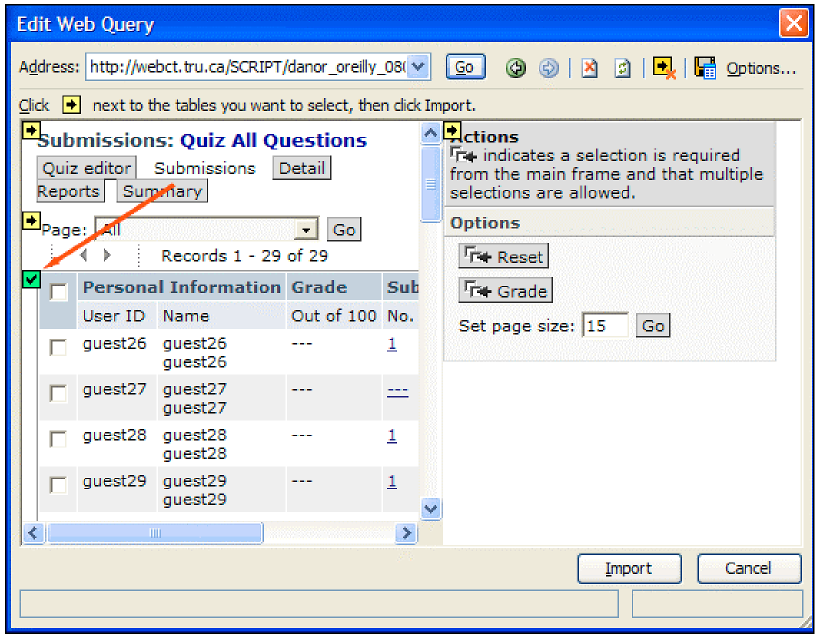
This should bring you to the WebCT server and Login screen (again this varies according to WebCT setup). Login to your designer account. All this is happening in the small window opened in the spreadsheet.



Locate the course module, and enter the Submission Page URL (discussed above) beginning at the slash just before SCRIPT, e.g., "/SCRIPT/danor_oreilly_0805/scripts/designer/serve_quiz.pl?ACTION=SUBMISSIONS&ID=988327492" overwrites the "/" before SCRIPT in "http://webct.tru.ca/SCRIPT/danor_oreilly_0805/scripts/serve_home".

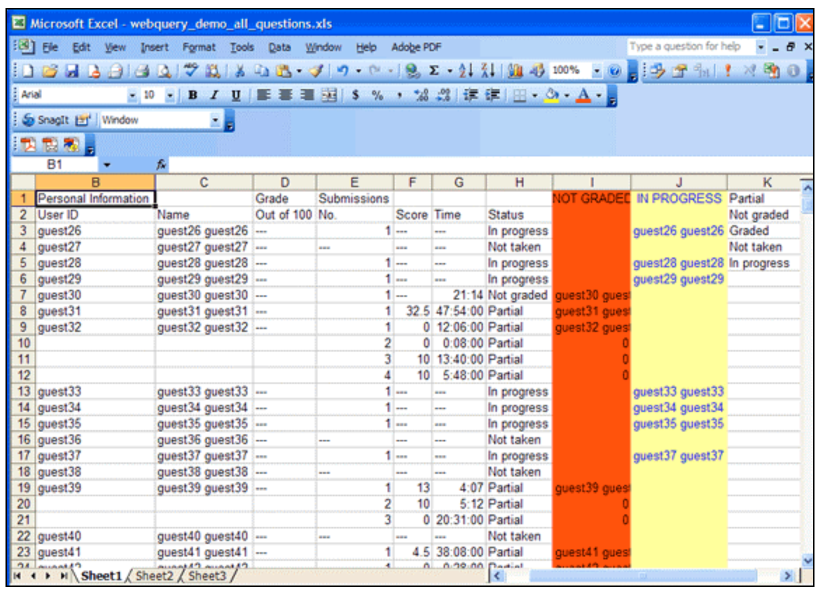


Once the URL is pasted, click GO. This then takes you to the Submissions page, listing all the students in the course. Click the yellow ▶. This turns to a green ☑. This identifies the data that you want to import from WebCT into Excel.



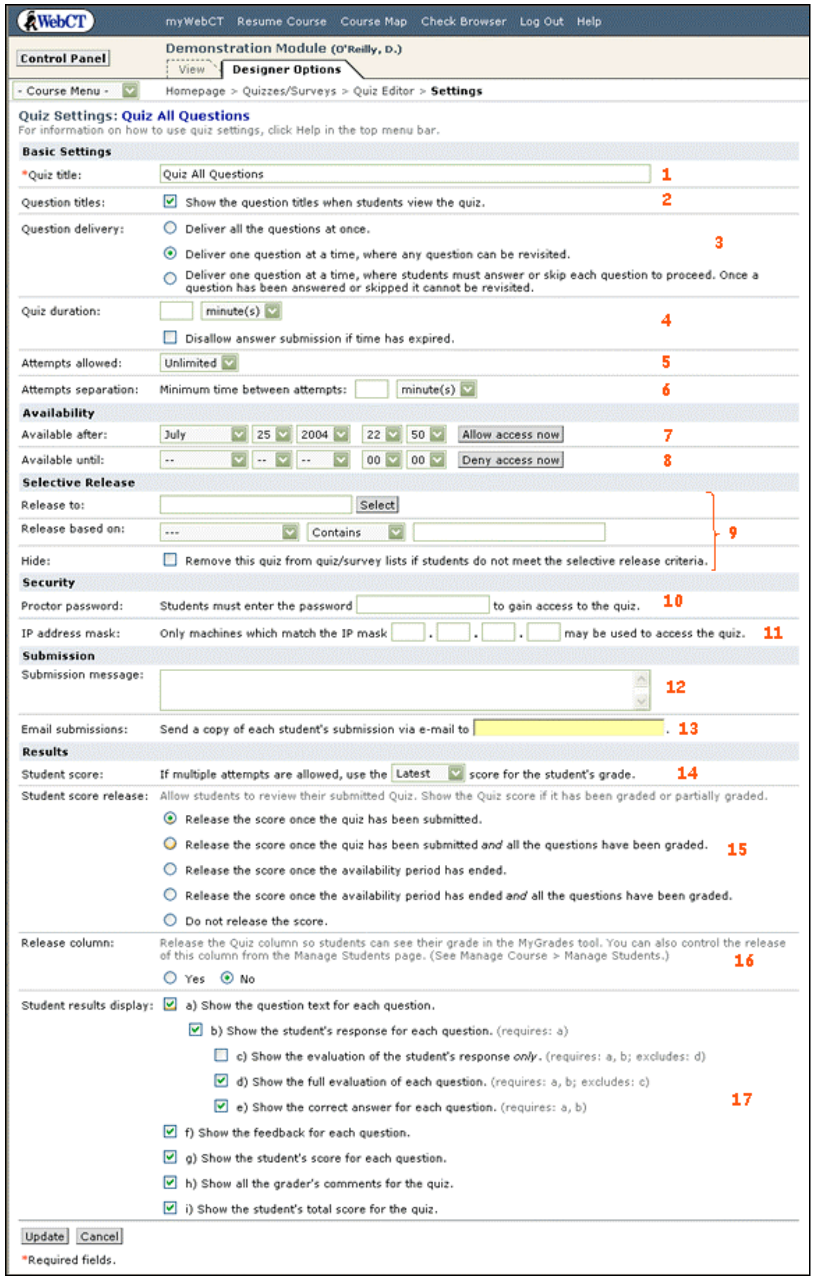
Click Import, importing the data from the Submissions page into your Excel spreadsheet.

This screen capture displays an Excel spreadsheet, in which I wrote macros and formulas to analyze the data pulled from the Submissions page. Excel has tools that allow you to continuously update the data being generated from WebCT. With WebQuery you are basically creating a real-time Excel window into the Submissions page of your WebCT Quiz. Excel WebQuerys can be used to mine data for a variety of different purposes in WebCT; they are exceptionally useful.



CONFIGURING THE WEBCT QUIZ SETTINGS

To open the Quiz Settings page: From Control Panel > Quizzes/Surveys > [Name of Quiz] > Edit Quiz Settings. Seventeen different areas can be identified in the Quiz settings.



In the following I only discuss a few of the 17 areas numbered above, many of these areas are covered in other sources about WebCT CE 4.x. I only cover those that are directly relevant to monitoring a quiz in a lab.

Controlled release of quizzes

Controlled release to specific students [9]

- You can release quizzes to the whole class or to only a subsection of the class, even to just one person.
- Even though you can control release to one account, more than one person can sign into an account (all using the same student/WebCT ID). So, a student could sign into a quiz, and have their bright friend in Timbuktu sign in at exactly the same time and complete the quiz for them, while the student sits in front of the workstation appearing to do the work. The best way to stop this is by controlling the IP Address, and setting and changing the password.

Controlled release to an IP address [11]
To reduce the risk that more than one person signs into the same account/quiz, you can release quizzes to a single IP address or to a range of IP address. This at least prevents the person in Timbuktu from accessing the quiz.

Controlled release by quiz password [10]
You can set a password to allow entry into a quiz. With this setting, the quiz cannot be started without the password. Not only does this assist to control unauthorized access to the quiz, it also gives you the power to force everyone to start the quiz at approximately the same time. This option combined with the release by User ID and the release by IP address can significantly reduce the possibility of unauthorized access.

Change the password during the quiz and deny access [10]
During the quiz, I usually reset the password as soon as everyone is into the quiz, which effectively prevents anyone new from signing in. This helps to prevent someone signing-on from a remote site (if you didn't restrict access by the IP address and they were emailed the current password by someone taking the quiz), especially someone who was authorized to do the quiz but did not show up.

Security Issues for totally online courses
Obviously, the security issues for totally online courses are quite different than for face-to-face courses. There is a fair amount of literature on this topic. Most universities and colleges have testing centres, and for a fee you can have students invigilated during an exam. I have done this with students taking my online logic course. These students arranged with a testing centre to use an Internet-enabled computer for completing their exams. An invigilator was also present. However, you still need to create an exam that is more demanding and that could not be easily completed by cheating. In testing centres, you seldom have the ability to check out the computer system the student uses for the exam, or to specify that there must be a secure browser.

WebCT types of quiz questions

by Dan O'Reilly

WEBCT (4.X)
In contrast to some of the other WebCT tools, such as the calendar or email, the WebCT Quiz Tool is more an environment than a single application. The WebCT Quiz Tool environment has four important parts, one is the question database, another is the quiz index, a third is the quiz editor and the fourth is the actual WebCT quiz (see Figure 14.1).

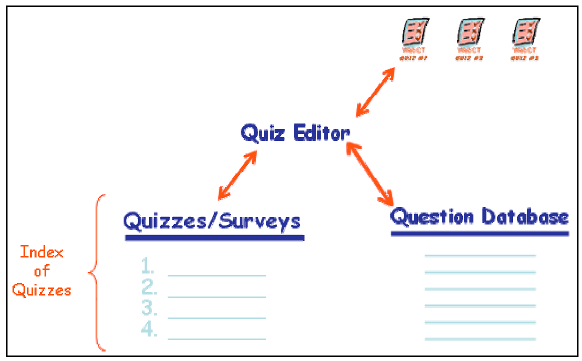


Figure 14.1

The question database contains the questions used in a quiz, the quiz editor organizes the questions from the database into a WebCT quiz, and the quiz index (technically referred to as the Quizzes/Surveys page) provides a quick index/link to all the quizzes and their results/statistics contained in the course module. This logical structuring allows the same question database to be used in a variety of different quizzes. You can even export questions from the question database to self-tests.

You access the Quiz Tool through the Control Panel. From the Control Panel you click on Quizzes/Surveys and that takes you to the Quizzes/Surveys page. Here you can create a new quiz or survey, edit an old quiz or survey, and modify the look of the Quizzes/Surveys homepage. From the Quizzes/Surveys page you can link to the question database. The Quizzes/Surveys page is the central hub of the Quiz Tool.

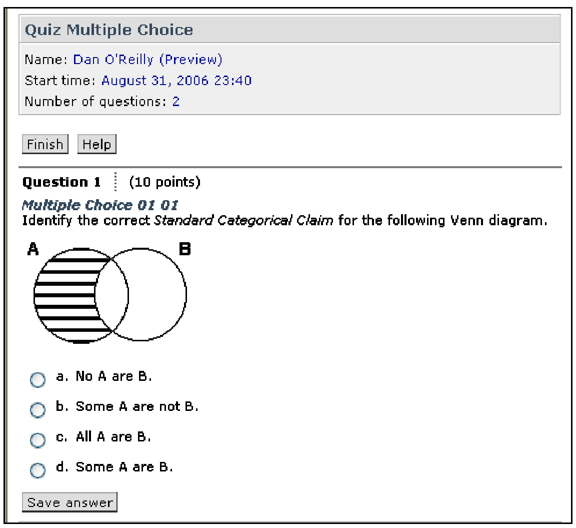
As part of the content of a quiz, you can link to external sources, such as images or other file types (HTML, audio, video, PowerPoint, XLS, etc.). Though the student would not be aware, the code causing this linking can be contained either in the individual questions (in the question database) or in the quiz module (entered through quiz editor). I will discuss linking from individual questions to other files first, and then I will discuss linking from the quiz module to other files. JavaScript can be used in this linking process to significantly enhance quiz presentation.

There are five different types of quizzes in WebCT, and one type, the short answer quiz, allows the student to enter either a single word or a more complex longer phrase as answer. The answers for these quizzes can be parsed using RegularExpression coding. This means that immaterial or trivial typing mistakes on the part of a student, such as an extra space between words, can be identified and will not be penalized. This reduces some of the anxiety often experienced with online testing. After discussing linking to files, I examine RegularExpression coding in some detail.

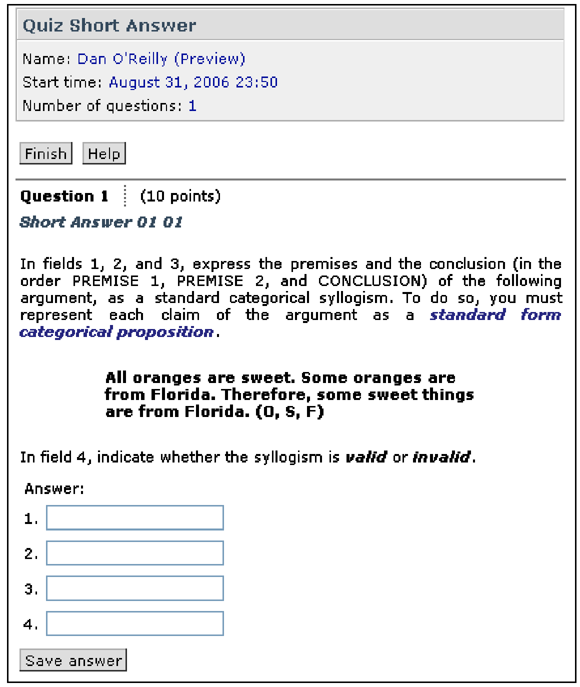
THE WEBCT QUESTION DATABASE

There are five different types of WebCT questions:

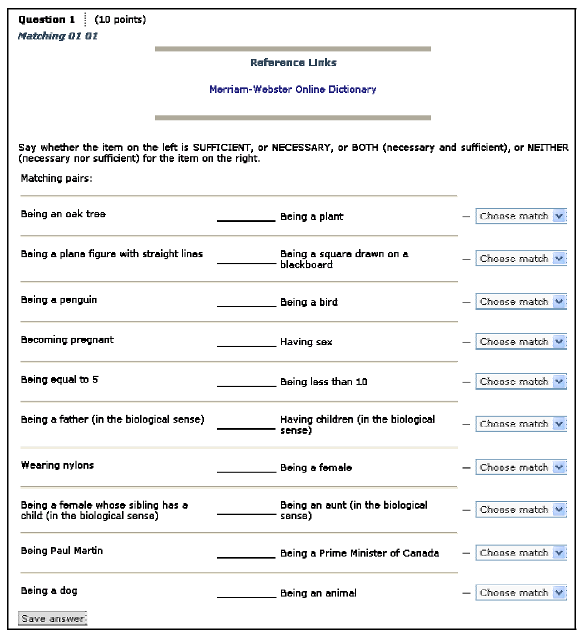
- **Multiple Choice**: MC questions are of two types, students are allowed to select either you or multiple answers to a question. The following example only demonstrates the one answer type.



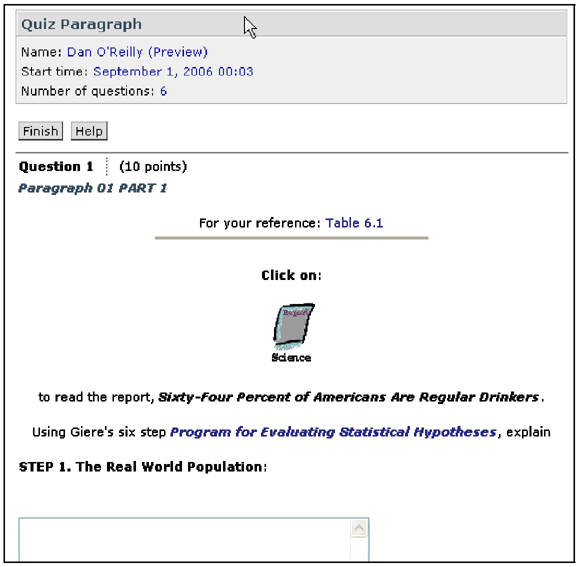
- **Short Answer**: Students enter a word, phrase or short sentence, which is then matched against possible answers. Short answer types of questions can use the RegularExpression feature for evaluating answers (more on this feature later).



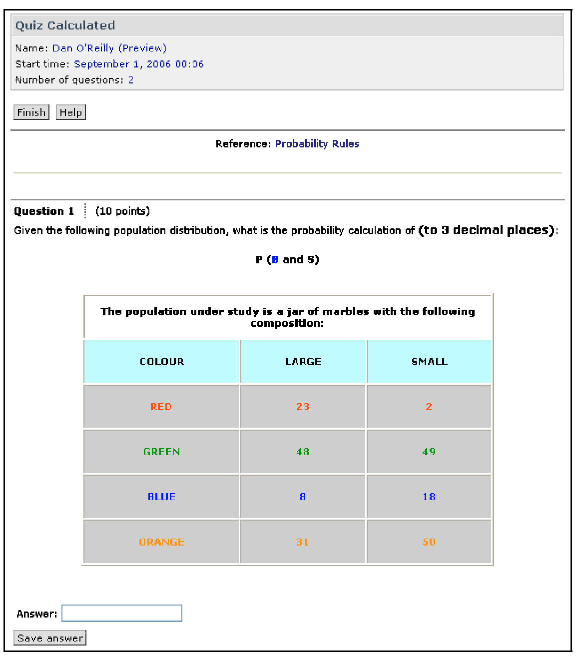
- **Matching**: Students match items in relation to two columns. This type of question uses a pull-down menu.



- **Paragraph**: Students answer the question using a longer essay-type format. The instructor or the teaching assistant must grade this type of question manually.



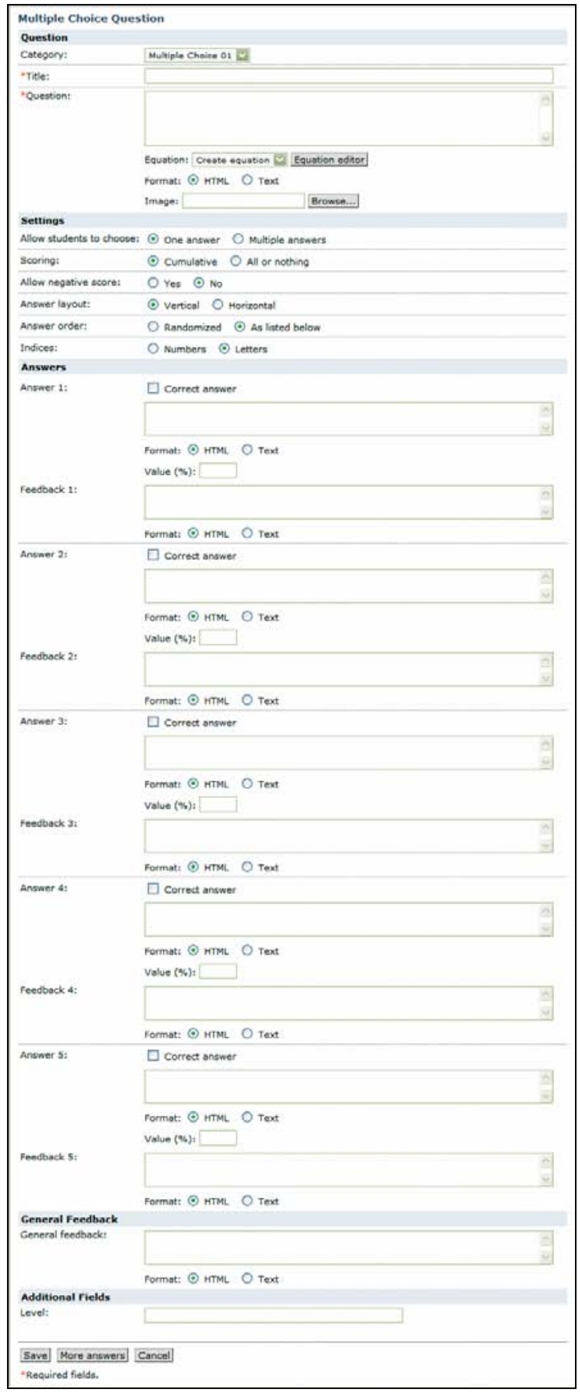
- **Calculated**: Students answer a mathematical question, which requires the use of a formula. In creating the question, the designer specifies the mathematical formula and the set of variables it uses, along with a range of values for each variable. Up to 100 different sets of answers are generated from the set of variables specified (each value in the table below is a variable, which in principle varies from one student to the next).



In each type of question shown above, you can link either to content contained within a WebCT directory or to content external to the WebCT course module.

LINKING TO IMAGES FROM A WEBCT QUIZ QUESTION

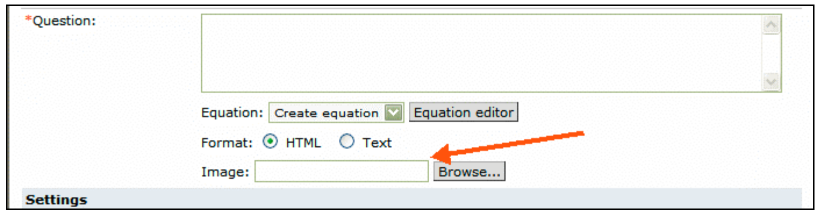
Though it does vary slightly from question type to question type, the entry screen to create or edit a quiz question usually has seven sections: category, title, question, settings, answers, and general feedback.



As well, you can also add other sections, for example, I always add a section for the level of difficulty of a question.

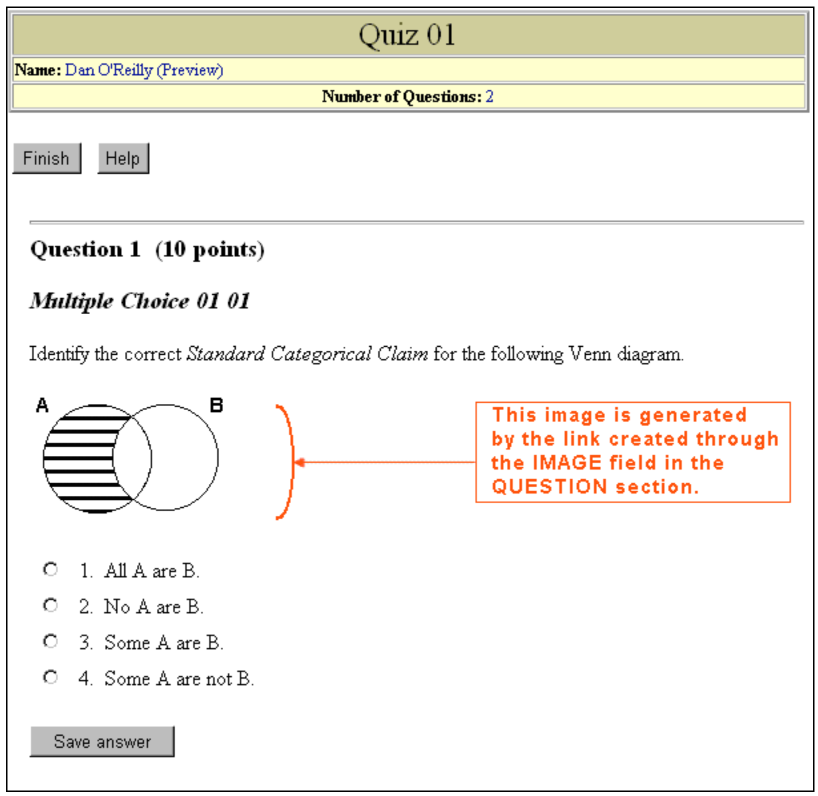
Two easy methods of linking to images

- **IMAGE FIELD**: In the question database section accessed with the question editor, WebCT provides a field to link to images.

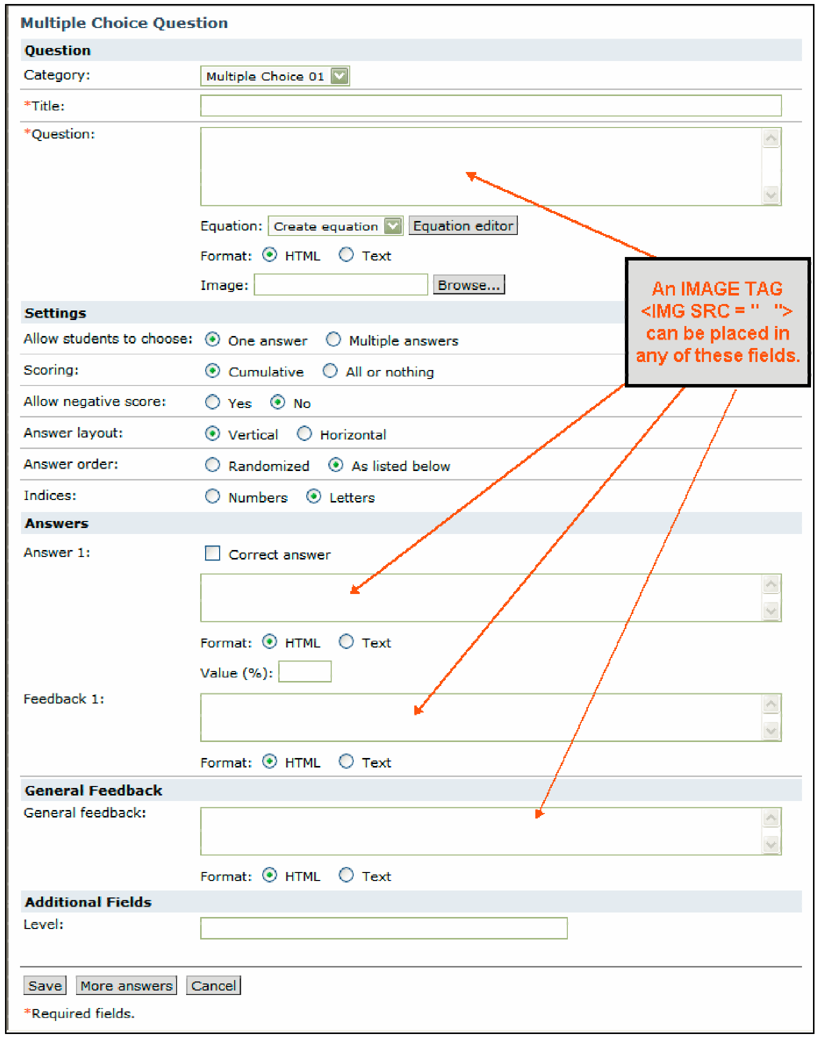


This field is primarily useful when a common image is used to provide information for each possible answer in the question, as in this example.

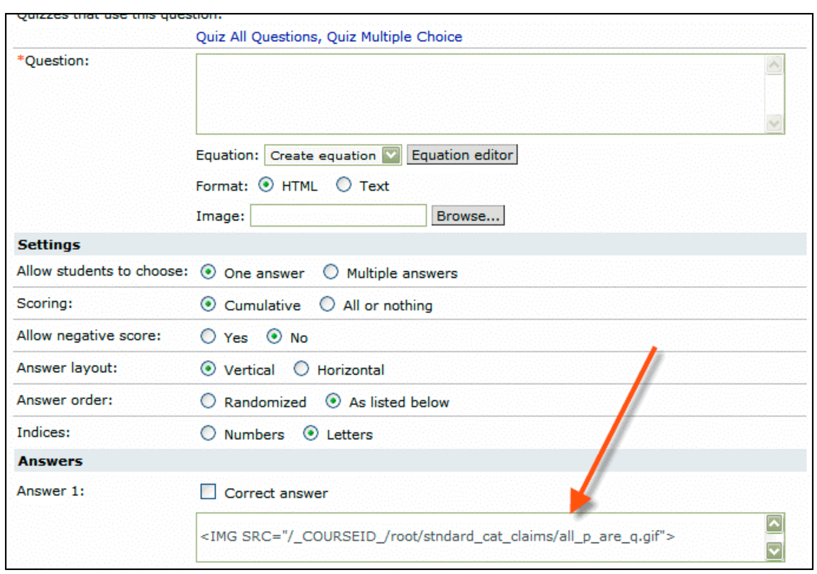
It is a simple matter to create the link to the image, click on the browse button to search the directory structure of WebCT for your graphic; you simply need to know where the image is located in your WebCT file structure.



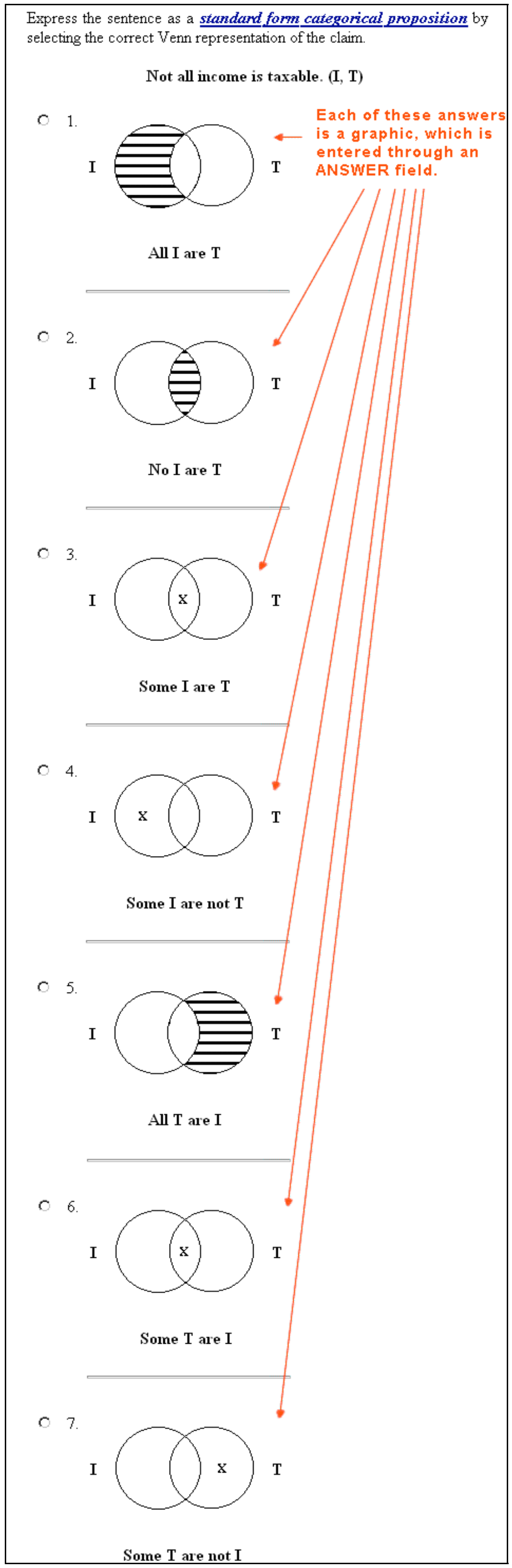
- **<IMG SRC=“ ”>**: If you want to be a little more creative in the use of images in your questions, each of the question field, the answer # field, the feedback # field, and the general feedback field can contain code to images, such as the HTML image tag, <IMG SRC=“ ”>, which is used to automatically display graphics in a HTML page. (These fields can also contain anchor links <A HREF=“ ”> to other HTML pages or external web pages. More on this later.)



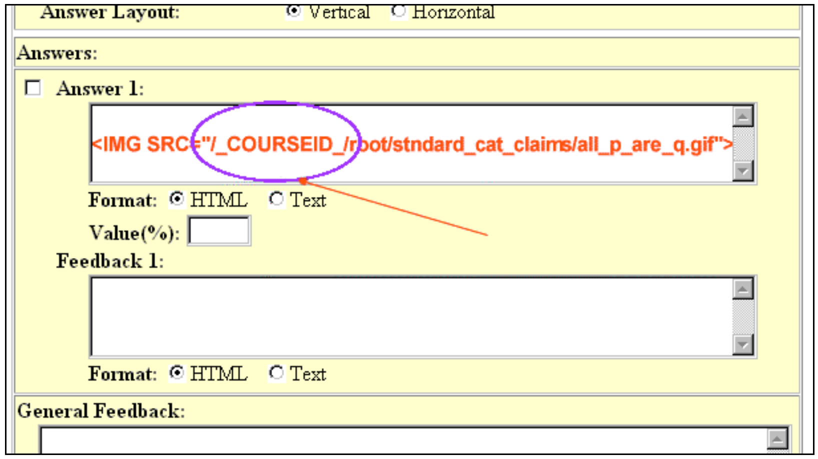
For example, suppose you wanted a graphic associated with each answer in a question. Simply enter the appropriate <IMG SRC=“ ”> tag in the answer field for each possible answer in your question.



I have created quizzes with up to seven possible answers (I do not know the limit).



An undocumented (though discussed on the WebCT listserv) variable in WebCT is the **_COURSEID_** variable. This variable takes on the value of the course root name; you can use it to locate the path to the image.



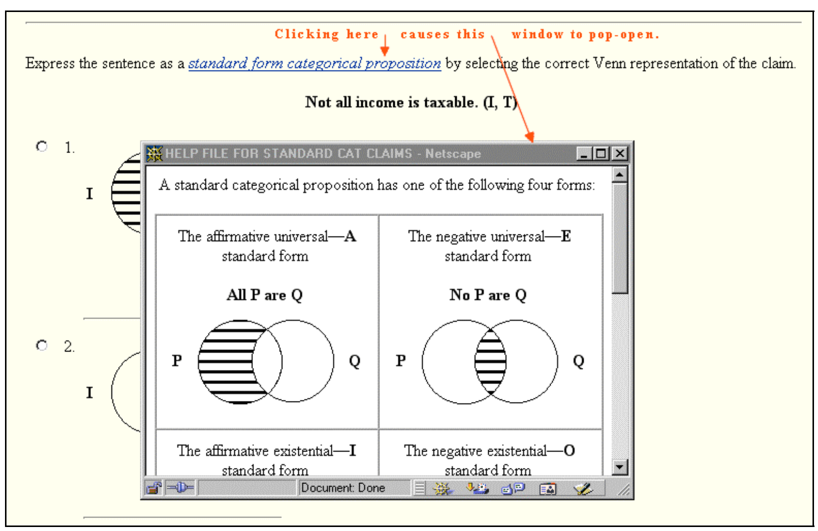
The value of using this variable is that it enables you to easily transfer a database of questions from you WebCT module to another, as long as the directory structure is logically the same. It also allows you to zip your course into a different WebCT root name.

Even though I am using the multiple choice question as an example, these methods of linking to files to provide content for a quiz apply to all the question types. The WebCT quiz environment is quite versatile and rich. Beyond the scope of this article, there are many other options that can be set at the individual question level, such as randomization of the index, multiple choice questions can be configured to accept only one answer or a number of possible answers each with a different value, etc. In addition, the quiz module itself, as distinct from the questions in the quiz, has a variety of different settings, which allows the quiz to be managed in a variety of different ways. In the section on supervising quizzes, I will discuss in some detail the quiz module settings.

In summary then, from within WebCT questions, there are two easy ways to link to images for display during a quiz, you is using the IMAGE FIELD in the question section and another is using the <IMG SRC=“ ”> tag within the question field, the answer # field, the feedback # field, and the general feedback field.

USING JAVASCRIPT TO LINK TO FILES

Besides using HTML tags in the fields of a question, you can also use JavaScript to link to images, and this gives you the ability to create pop-up windows in your quizzes.

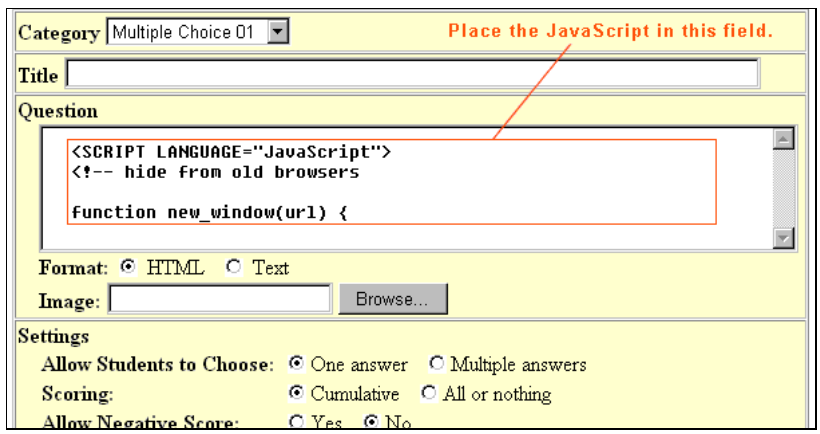


Besides linking to images, you can also link to other types of web documents, everything from standard HTML pages, to audio files, video files, PowerPoint files, etc. These links can be to files within your course or to files external to your course. For example, I frequently provide a link to the ***Merriam-Webster Online Dictionary*** for many of my quizzes.

A simple JavaScript to generate a pop-up window is shown here. [The code in red is not part of the JavaScript required to create the pop-up window link.]

```
<SCRIPT LANGUAGE="JavaScript">
< !-- hide from old browsers
function new_window(url) {
link =
window.open(url,"Link","toolbar=0,location=0,directories=0,status=1,menubar=0,scrollbars=yes,resi
zable=yes,width=550,height=300,left=60,top=100");
link.focus()
}
// end script hiding -->
< /SCRIPT>
< HR WIDTH=50% ALIGN=center SIZE=5 NOSHADE>
< H3 ALIGN=center>Reference Links</H3>
< P ALIGN=center>
< a href="javascript:new_window('http://www.m-w.com/home.htm')">Merriam-Webster Online
Dictionary</A>
< P><HR WIDTH=50% ALIGN=center SIZE=5 NOSHADE>
< P ALIGN=justify>Say whether the item on the left is SUFFICIENT, or NECESSARY, or BOTH (necessary
and sufficient), or NEITHER (necessary nor sufficient) for the item on the right.
```

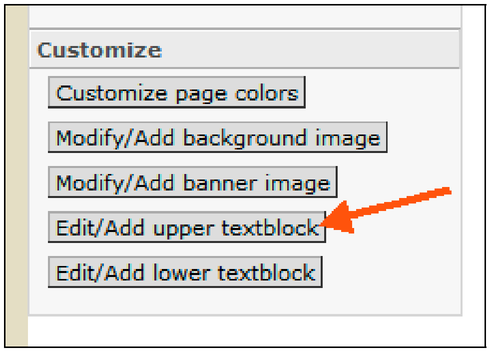
This script can be placed in the question field of a question template (only a portion of the JavaScript is shown in the following field).



LINKS FROM THE WEBCT QUIZ MODULE

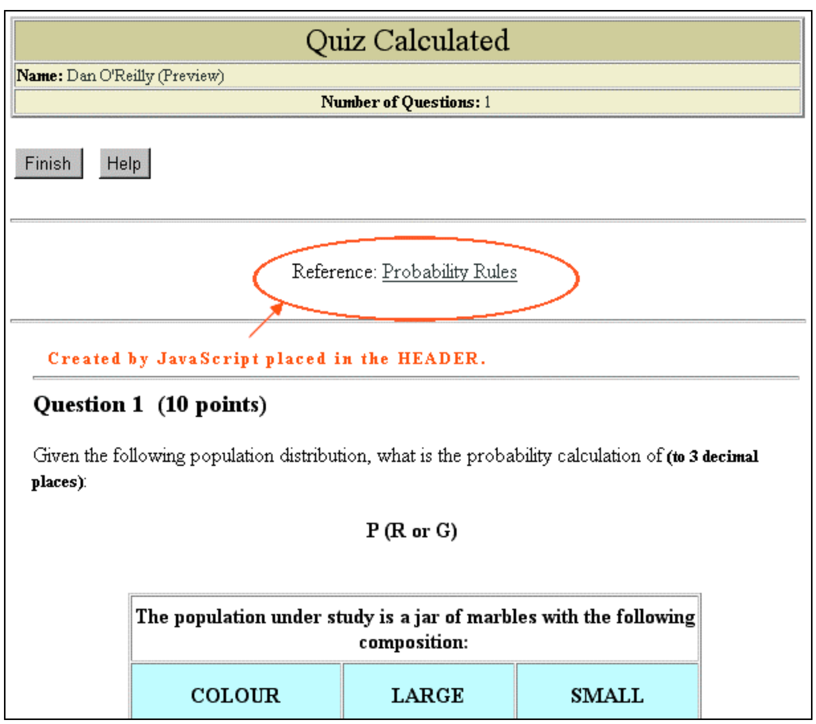
The quiz module is created/edited through the Quizzes/Surveys link. Go to the Quizzes/Surveys page and select the quiz. When you click on the quiz name you are automatically put into the quiz editor. The quiz editor assembles and connects the various parts of a quiz (which I am referring to as the quiz module). Most importantly, through the quiz editor you link the questions from the question database to a quiz. Here you can add questions, delete questions, modify the settings for a quiz, and preview the quiz, to name but a few of its functions. This is where you can program WebCT to randomly generate a set of questions from a database of questions.

The quiz editor allows you to modify the page style of the quiz. One of the modifiable style features is the upper textblock.



In the textblock you can place a variety of JavaScripts. *(Just a note of caution at this juncture: You should always do a backup of your course before you try any JavaScript in textblocks. Some JavaScript can completely disable a page. So, it is handy to have a backup of your course in case your JavaScript crashes your system.)* When I want a link to the same information for every question in a quiz, I place the JavaScript code that creates the pop-up window/link in the upper textblock of the quiz module.

When the JavaScript is placed in the textblock, it operates on every page of the quiz.



The JavaScript code used to generate the pop-up window for the quiz linked to this page is shown here.

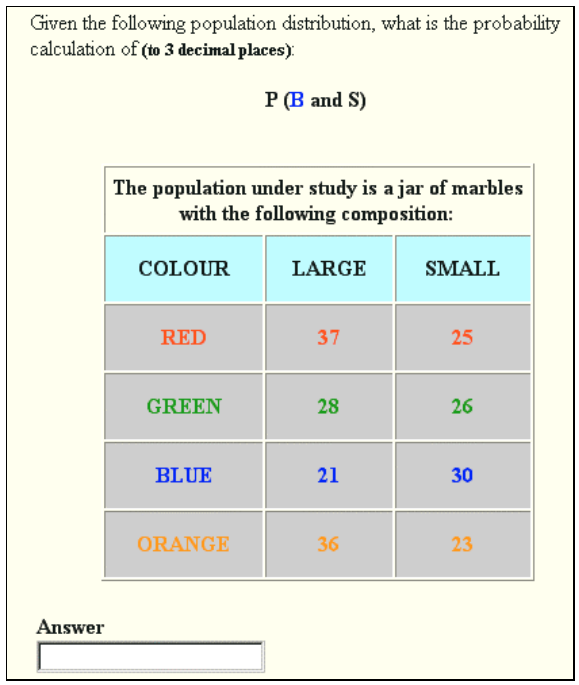
```
<SCRIPT LANGUAGE="JavaScript">
< !-- hide from old browsers
function new_window(url) {
link =
window.open(url,"Link","toolbar=0,location=0,directories=0,status=1,menubar=0,scrollbars=yes,resizable=
yes,width=550,height=300,left=60,top=100");
link.focus()
}
// end script hiding -->
< /SCRIPT>
< P ALIGN=center>Reference: <a
href="javascript:new_window('//root/calculated_question/probability_rules.htm')">Probability
Rules</A>
< P><HR>
```

ADVANCED FEATURES WITH HTML AND JAVASCRIPT IN WEBCT QUIZZES

In two of the quizzes created for this section on WebCT Quizzes, I used some relatively advanced coding features of HTML and JavaScript.

Use of HTML in question field

For example, in the calculated question example, I create the table for the quiz using the following HTML code.


Given the following population distribution, what is the probability calculation of **(to 3 decimal places)**:

P (B and S)

The population under study is a jar of marbles with the following composition:

COLOUR	LARGE	SMALL
RED	37	25
GREEN	28	26
BLUE	21	30
ORANGE	36	23

Answer

Calculated questions allow the use of variables, and if you scan this code you will notice the variables by looking for braces, e.g., { }. Using the variable feature of calculated questions enables you to generate hundreds of examples from one question.

```
<P>
Given the following population distribution, what is the probability calculation of <FONT
SIZE=-1><B>(to 3 decimal places)</B></FONT>:
<P ALIGN=center><B> P (<font color="#0000FF">B</font> and <B>S</B>)
</B>
<P ALIGN=center> 
<table width="75%" border="1" cellspacing="1" cellpadding="1" align=center>
<tr>
<td COLSPAN=3 align="center" height="50" ><b>The population under study is
a jar of marbles with the following composition:</b></td>
</tr>
<tr align="center" bgcolor="#CCFFFF">
<td height="50"><b>COLOUR</b></td>
<td height="50"><b>LARGE</b></td>
<td height="50"><b>SMALL</b></td>
</tr>
<tr align="center" bgcolor="#CCCCCC">
<td height="50"><b><font color="#FF0000">RED</font></b></td>
<td height="50"><b><font color="#FF0000">{r2}</font></b></td>
<td height="50"><b><font color="#FF0000">{r3}</font></b></td>
</tr>
<tr align="center" bgcolor="#CCCCCC">
<td height="50"><b><font color="#339900">GREEN</font></b></td>
<td height="50"><b><font color="#339900">{g2}</font></b></td>
<td height="50"><b><font color="#339900">{g3}</font></b></td>
</tr>
<tr align="center" bgcolor="#CCCCCC">
<td height="50"><b><font color="#0000FF">BLUE</font></b></td>
<td height="50"><b><font color="#0000FF">{b2}</font></b></td>
<td height="50"><b><font color="#0000FF">{b3}</font></b></td>
</tr>
<tr align="center" bgcolor="#CCCCCC">
<td height="50"><b><FONT color="#FF8000">ORANGE</FONT></b></td>
<td height="50"><b><FONT color="#FF8000">{o2}</FONT></b></td>
<td height="50"><b><FONT color="#FF8000">{o3}</FONT></b></td>
</tr>
</table></P>
```

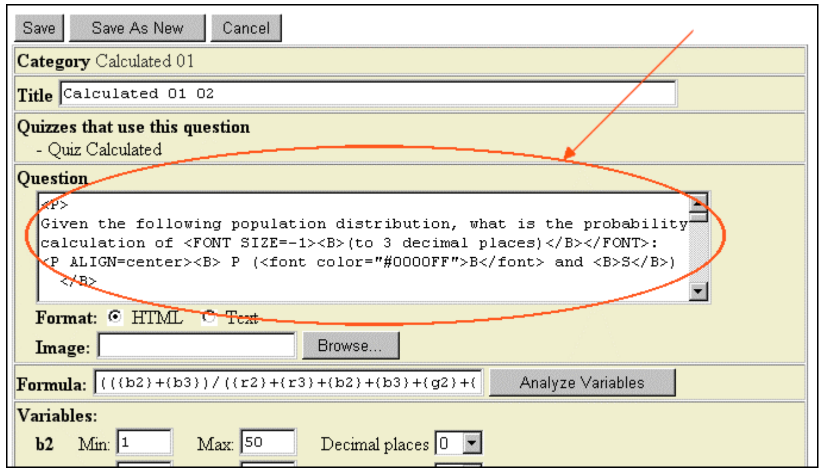
I created this code in the HTML editor Dreamweaver, which gives a WYSIWYG view of the variables.

Given the following population distribution, what is the probability calculation of **(to 3 decimal places)**:

P (B or O)

The population under study is a jar of marbles with the following composition:		
COLOUR	LARGE	SMALL
RED	{r2}	{r3}
GREEN	{g2}	{g3}
BLUE	{b2}	{b3}
ORANGE	{o2}	{o3}

… and then placed the code in the question field of the calculated question template (only the top part of the code is shown here).

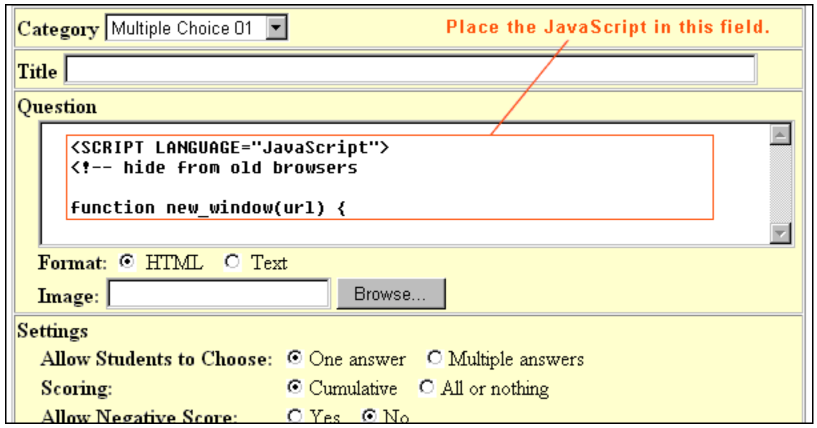


Use of JavaScript memory variables

In the multiple choice question on page 230 displaying a graphic for each possible answer, I use JavaScript memory variables to supply the category reference labels, as well as the standard form formulas. This enabled me to create one template to generate over 100 exercises; I only had to change the memory variable entry in one location rather than eight locations for each question (which is what I would have to do if I had entered the values as constants). The JavaScript code used to create the memory variables looks like this.

```
<SCRIPT LANGUAGE="JavaScript">
<!-- hide from old browsers

var main_term = "Not all income is taxable. (I, T)"
var p_term = "I"
var q_term = "T"
var all_p_are_q ="All "+ p_term +" are "+ q_term
var no_p_are_q = "No "+ p_term +" are "+ q_term
var some_p_are_q = "Some "+ p_term +" are "+ q_term
var some_p_are_not_q = "Some "+ p_term +" are not "+ q_term
var all_q_are_p = "All "+ q_term +" are "+ p_term
var some_q_are_p = "Some "+ q_term +" are "+ p_term
var some_q_are_not_p = "Some "+ q_term +" are not "+ p_term

function new_window(url) {

link = window.open(url,"Link","toolbar=0,location=0,directories=0,status=1,menubar=0,scrollbars=
yes,resizable=yes,width=450,height=300,left=120,top=180");
link.focus()
}

// end script hiding -->
</SCRIPT>
<P ALIGN=justify>Express the sentence as a <a
href="javascript:new_window('/_COURSEID_/root/stndard_cat_claims/help_stnd_claims.htm')">
<I><B>standard form categorical proposition</B></I></A> by selecting the correct Venn
representation of the claim.
<P ALIGN=center><B>
<SCRIPT LANGUAGE="JavaScript">
<!-- hide from old browsers
document.write(main_term)
// end script hiding -->
</SCRIPT>
</B></P>
```

Similar to the first example, the code is placed in the question field of the multiple choice question (again only the top part of the code displays in this example).

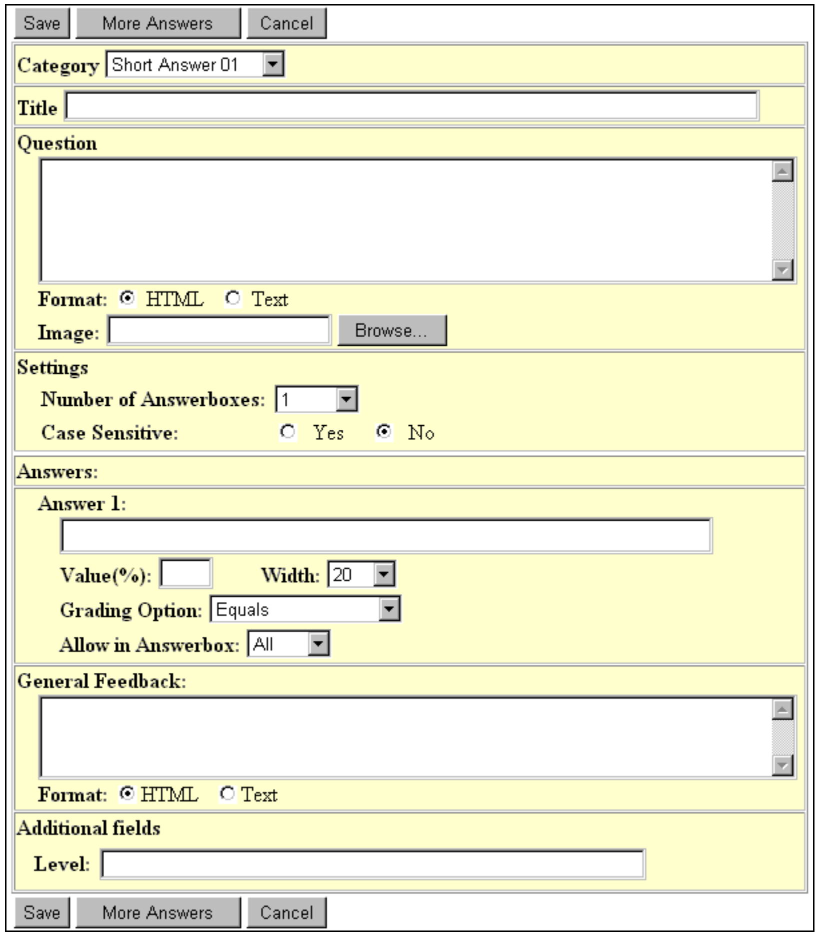


Subsequently, each answer field has code similar to the following which makes use of the variables defined by the JavaScript in the question field.

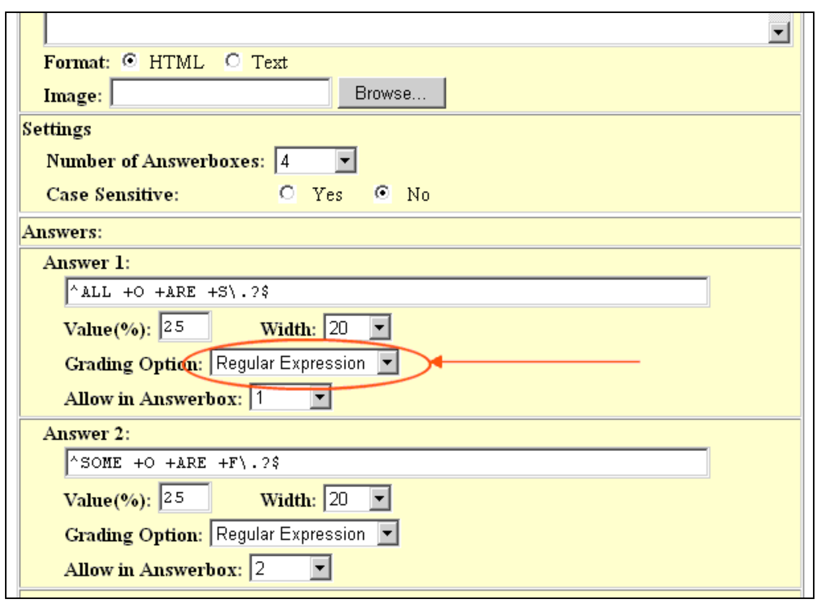
```
<P><TABLE ALIGN=center BORDER=0 WIDTH=100%><TR>
<TD><B>
<SCRIPT LANGUAGE="JavaScript1.2">
<!-- hide from old browsers
document.write(p_term)
// end script hiding -->
</SCRIPT>
</B></TD><TD ALIGN=center>
<IMG SRC="/_COURSEID_/root/stndard_cat_claims/all_p_are_q.gif">
</TD><TD><B>
<SCRIPT LANGUAGE="JavaScript">
<!-- hide from old browsers
document.write(q_term)
// end script hiding -->
</SCRIPT>
</B></TD></TR></TABLE>
<P ALIGN=CENTER><B>
<SCRIPT LANGUAGE="JavaScript">
<!-- hide from old browsers
document.write(all_p_are_q)
// end script hiding -->
</SCRIPT>
</B><P><HR>
```

SHORT ANSWER WITH REGULAR EXPRESSION

As is the case for the other quiz types, the entry screen for a short answer quiz generally has five sections: category, title, question, answers, and general feedback.



The answer section, however, is a little more complex than on the multiple choice question. In this question type, there is a pull down menu to select the grading option, and one grading option is *Regular Expression*. The regular expression option enables you to parse the input. This assists in reducing the number of simple data entry errors, such as the student entering an extra space between words, in a multiple word answer.



In the example shown above, the ^ tells the parser that the entry has to begin at the beginning of the line; the + tells the parser that it can match one or more occurrences of the character immediately to the left (in this case a space); the \ tells the parser that the character following is a period (not a meta character); the **?** tells the parser that the character to the left (the period) may or may not be there, but if it is there it should only occur once; and the **$** tells the parser this should be the end of the entry. As I do not want my quizzes to be a course about typing, regular expressions can reduce significantly the number of answers marked incorrect due to trivial typing errors. This mean all the following would be treated as correct by the regular expression parser:

Some O are F.

some o are f.

some o ARE F

SOME O ARE F

The following are links to pages about ***Regular Expression**:*

- Henk's Test a RegExp
  http://home.wanadoo.nl/h.schotel/testaregex/
- Henk's Quia Page
  http://www.quia.com/pages/regex.html
- The Regex Coach
  http://www.weitz.de/regex-coach/
- Regular Expression HOWTO
  http://www.amk.ca/python/howto/regex/
- Regular-Expressions.info
  http://www.regular-expressions.info/

One of the links is to an applet, which tests your RegularExpression, another is to the Regex Coach, a program which can be downloaded. I have found both these tools invaluable when creating regular expressions. The other links are to online reference material about RegularExpression. Some of these links were created and are maintained by Henk Schotel. For those who have visited the WebCT Home Page and specifically the Dr. C support facility, you will recognize Henk as one of the experts who contributes to Dr. C.

Third-party tools

There are several free or low-cost third-party assessment tools available over the Internet:

- The Discovery School website "offers teachers of all subjects and array of powerful tools" for assessment (http://school.discovery.com/teachingtools/teachingtools.html). Use Puzzlemaker to generate crossword puzzles, word searches, and math squares. Visit the Quiz Center to create and give quizzes. Try the Worksheet Generator to create custom worksheets for your course materials.
- Higher education and K–12 instructors use Quia ('key- ah) "to create customized educational software online, built around their own course materials and made available to students over the Web" (http://www.quia.com/company/quia_web.html). Quia is a subscription-based service.
- Half Baked Software, Inc., created Hot Potatoes, a set of applications that allow instructors "to create interactive multiple-choice, short-answer, jumbled-sentence, crossword, matching/ ordering and gap-fill exercises for the World Wide Web" (http://hotpot.uvic.ca/). You can also include MP3 audio files and math symbols as part of these assessment activities. Hot Potatoes requires a licensing fee, unless you work for a publicly funded, non-profit educational institution.
- QuizStar is a free web-based tool for K–12 instructors to create and assign quizzes, manage student results, and allow students "to review the results for further learning" (http://quizstar.4teachers.org/).

Some publishers offer assessment tools that accompany textbook activities. For example, Glencoe Online Mathematics provides an Online Study Tools site (http://www.glencoe.com/sec/math/studytools/index.php4).

Authentic student assessment strategies for the online environment

by Kevin Kelly

Often when we talk of assessment in an online environment, we think of automated quizzes and grade books. While useful in many circumstances, automated quizzes do not always accurately reflect a student's abilities, especially when you are asking them to achieve a higher level of difficulty in the cognitive learning domain, to demonstrate a physical skill in the psychomotor learning domain, or to evaluate attitudes in the affective learning domain (see description of learning domains and degrees of difficulty at http://www.nwlink.com/~donclark/hrd/bloom.html). Authentic assessment—assessing student abilities to apply knowledge, skills, and attitudes to real world problems—is not only possible in an online environment; it is getting more popular.

PREPARING AN ASSIGNMENT FOR ASSESSMENT

The first step to assessing online work is to prepare each assignment. Since students may not have you around to ask questions, you need to anticipate the types of information that students need. There are some standard items to include in your instructions for all types of online assignments:

- Name of the assignment (This should be the same name as listed in the syllabus).
- Learning objective(s) to which this assignment relates.
- When the assignment is due.
- Any resources that you recommend using to complete the assignment.
- Expectations (length, level of effort, number of citations required, etc.).
- Level of group participation (individual assignments, group or team projects, and entire class projects).
- Process (how students turn in the assignment, if they provide peer review, how peers give feedback, how you give feedback).
- Grading criteria (include rubric if you are using one).

By including these items, you give students a better idea of what you want them to do.

When you consider what types of online assessment strategies to choose, the list will be very similar to the print-based strategies that you know and already use. However, there are a few additional assessment strategies that the online environment makes possible. The list below is not comprehensive by any means. It also does not show which tools could be used to facilitate the different types of assessment strategies. Some of these activities may require students to have access to equipment or software applications to complete.

Table 14.1. Assessment strategies and disciplines that may commonly use them

Type of assessment strategy	Disciplines that might use each assessment strategy
text-based	
essay	multiple
glossary	multiple
lab manual	physical sciences
computer code	computer science
technical writing	technical and professional writing
reflection	teacher education, health education, social work
observation log	teacher education, nursing, laboratory sciences
media	
image gallery	art, industrial design
web page or website	multiple
presentation	business, public administration
audio	language acquisition
video	theatre arts (monologue), marketing

Notice that some assessment strategies require participation by someone other than the student. For example, a K–12 master teacher would submit an observation log for a credential student performing his or her student teaching. Similarly, a health clinic supervisor would submit an observation log for a nursing student related to his or her abilities to draw blood for testing. A theatre arts student may need someone to record his or her monologue.

Some assessment strategies allow students to get creative. In Chapter 11, Accessibility and Universal Design, the section on Universal Design for Learning discusses the concept of letting students decide what product or process they will use to demonstrate knowledge, skills, or attitudes. Chapter 11 also covers important aspects of making sure that students have access to, or ability to use the technologies required to complete the tasks. Once you do that, you could ask students to create a video advertisement that demonstrates the application of marketing principles, an audio recording that demonstrates mastery of inflection and tone when speaking Mandarin Chinese, or a PowerPoint slide show with audio clips that demonstrates competency with teacher education standards. The age-old practice of storytelling has been "remastered" as digital storytelling through blogs, wikis, podcasts, and more. Students are taking advantage of these new media formats to illustrate that they have met certain requirements. In some cases, each product becomes an "asset" or "artifact" in a larger electronic portfolio that contains items for a single class, an entire program or department, or all curricular and co-curricular work that a student does. Regardless of what products students provide to show their abilities, you need a way to evaluate their work.

DEFINING EXPECTATIONS

After determining how students will show how they can meet the learning objectives, it is time to choose an evaluation method. You can use a number of tools, ranging from a simple checklist of criteria to a rubric that contains the same criteria as well as a range of performance and degrees to which students meet the criteria. You can use qualitative or quantitative degrees to evaluate criteria (see Table 14.2 for an example of each). Share the checklist or rubric with students before they begin the assignment, so they know what will be expected of them. In some cases, instructors create the entire rubric, or portions of it, with the students.

Table 14.2. Portion of a student presentation assessment rubric

Criteria	Range			
	4	**3**	**2**	**1**
Student supports main presentation points with stories or examples	Student effectively used stories and/or examples to illustrate key points.	Presenter used stories and/or examples somewhat effectively to illustrate some key points.	Presenter used some unrelated stories and/or examples that distracted from key points.	Presenter did not use stories or examples to illustrate key points.
	Comments:			
Cover project completely, including:	Presentation covered all 6 of the areas to the left.	Presentation covered 4 or 5 of the areas to the left.	Presentation covered 2 or 3 of the areas to the left.	Presentation covered 1 or 0 of the areas to the left.
1) Needs Assessment Objectives, 2) Extant Data Analysis, 3) Data Collection Methods, 4) Brief Summary of Data, 5) Collected Data Analysis, 6) Recommendations	Comments:			

Invite students to use the same rubric for peer review assignments. Students benefit from reviewing peers' work, as they get to see different ways of approaching the same objective. These same students benefit from their peers' additional feedback. Let students know that merely giving a numeric score for each criterion is not enough. For peer review to be "constructive criticism," students must help each other construct better answers, better arguments, and better performance. In addition to clarifying expectations about the assignment through the rubric itself, you must clarify expectations about how students use the rubric for peer review.

Tip
If you have never created a rubric before, there are online tools that guide you through the process. Rubistar is "a free tool to help teachers create quality rubrics" (http://rubistar.4teachers.org). The site also has example rubrics and information about how to analyze student performance.

TEACHING AND TECHNOLOGY IN THE ASSESSMENT PROCESS

The next step in the assessment process is to facilitate the student work in the online environment, or to provide avenues for students to submit their work to you. More online tools emerge every day, it seems, and with them come new opportunities for students to perform activities related to the learning objectives and for us to assess student performance. We will cover a range of tools used for assessment delivery, pros and cons related to using each of these tools, and strategies related to the teaching and the technology aspects of using them.

EMAIL OR LISTSERVS

Email can be used for distributing assignments from student to instructor, from student to small group, or from student to the entire class. It will depend on what role peer feedback plays in the overall assignment. Since almost everyone in an educational setting uses email, it seems like an easy solution for students to submit their work for evaluation. However, as easy as it is to use, email is not foolproof. Email messages get blocked by spam filters, by overprotective Internet Service Providers, and by inadequate storage capacity, to name a few possibilities. Another issue with email arises when you try to organize all of the files received for a particular assignment. As you create more assignments, it will be harder to separate one from the other. Attachments sometimes get separated from the email message, and large attachments sometimes do not get through due to size limitations. If you have a large class, the volume of email may become overwhelming.

If you do use email as a mechanism to collect student work for evaluation, then require your students to use a specific email subject that will make them easy to sort, such as "Assignment 3—Juan Doe." Keep in mind that even with the most explicit instructions, not every student follows them. To assess each student's work, you will follow the same process as you do for print-based assignments.

REFLECTIVE JOURNALS VIA WEBLOGS

Instructors in many fields require students to write journal entries or reflective essays. In some cases, these exercises give students a chance to practise writing. In other cases, journal entry assignments force students to reflect on specific experiences and their attitudes about those experiences. While students can write their reflections almost anywhere, a tool called a weblog provides a forum for students to record their thoughts and, in some cases, to control who can access their reflections. You can find more information about weblogs themselves in Chapters 25 and 27. For the purposes of this chapter, we will focus on assessment strategies for students' weblog entries.

As journal entries and reflections are not standard for all students, you will have to adopt different assessment strategies. For instance, rather than evaluate the content of the weblog entries, you can evaluate them based on regularity, length and whether or not the content is appropriate to the topic or theme. You may also want to submit notes or comments and possibly ask students to write weblog responses to those comments. Regardless of your approach, make sure that students know how they will be evaluated before they begin the work.

DISCUSSION FORUMS WITHOUT ATTACHMENTS

Discussion forums are a useful tool to assess student knowledge and attitudes. They can also be used for higher level thinking assignments such as the One Sentence Summary, which requires students to synthesize a complex process (see example directly below). You can assign points to the students' original work as well as any peer review portion of the assignment.

Example:
Based on the chapter you have read about international export and import regulations, identify a topic that you want to summarize.

PART 1—DUE Friday at 11:59 pm (10 points): Click "Add a new discussion topic" below. For the topic you identified, answer the questions below and string into YOU SENTENCE. If your answer is longer than you sentence, then try again.

Who ____________________
does What____________________
to Whom (or What) ____________________
When ____________________
Where____________________
How ____________________
and Why? ____________________

PART 2—DUE Tuesday at 4:00 pm (10 points): Read two or more one-sentence summaries that do not have two replies yet. If it has two replies move to the next one. Select a rating. Click "Reply" and provide feedback:

- If you agree with the summary, say why.
- If you do not agree with the summary, provide evidence and suggestions for improvement.
- If the summary is missing one part ("How", "Why", etc.), then fill in the blank.
- Only the instructor's ratings will count towards the grade. The other students' ratings are to give you ideas about how much work you may have to do to revise your statement.

Sometimes students wait until the last minute to complete assignments. For a discussion forum assignment, this means that students post their ideas and reply to their peers all in the same brief period before the deadline. Unfortunately, the result is that not all students get replies or feedback for their ideas, even if they completed the assignment well ahead of the deadline.

If you want the students to engage in an actual discussion, then you should break up the assignment into parts with separate deadlines. Assign points to each portion of the assignment to encourage students to complete both parts (see example below).

Example:
WEEK 04 ONLINE ACTIVITY

Step 1: Go to the following online workshop about using existing data: http://www.k12coordinator.org/onlinece/onlineevents/assessment/index.htm

(NOTE: The workshop says it takes one hour for each of the five sections. That is for their purposes. Plan to spend one or two hours at your own pace. Most of this will be discussion, since there is not too much to read.)

Step 2: Read through the five sections.

Step 3: BY FRIDAY (9/23) AT 11:59 PM, do the following:

- 10 points—Post two original threads (one answering each question in this Forum)
- Use your project name in the title of your reply.

Step 4: BY TUESDAY (9/27) AT 5:00 PM, do the following:

- 10 points—Post two reply threads for each question (one from your team and one from a different team that does not have two responses yet).

DISCUSSION FORUMS WITH ATTACHMENTS

Discussion forums keep track of the date and time that assignments are submitted. This feature helps instructors who may have included a late submission policy in their syllabus, such as "Students will receive half credit for late assignments submitted up to two weeks after the assignment is due."

MAKING ONLINE AUTHENTIC ASSESSMENT AN ITERATIVE PROCESS

Online work does not require everyone to be in the same room, at the same time, so you can take advantage of the online environment to make assessment an iterative process. As we previously stated, authentic assessment mimics work that students will encounter in the real world, such as creating antiviral drugs in a biopharmaceutical lab, making presentations to potential donors to a non-profit organization, or teaching civics lessons in an inner-city high school. In these work environments, there are benchmarks or milestones that allow people to check their progress. You can use authentic assessment methods like the peer review rubric to replicate this process. For example, you may have the students provide peer feedback first, as a way to improve their work before turning it in for a grade, or you may have them provide it at the same time as your own with the option to rewrite it. By creating additional parts to each assessment strategy, students will learn even when you are evaluating them.

Summary

This has been an overview in some cases and in others a detailed examination of the types of issues you need to consider when evaluating student performance in the online environment. The issues covered in this chapter include security for online testing, creating quizzes in WebCT, finding third-party assessment tools, and authentic assessment strategies.

If you are going to administer an online exam and students will be on campus, it is important to think about the computer lab environment. Work with lab managers to have students use secure browsers and/or computer monitoring software, like NetSupport. You can also use Excel with WebQuery to monitor large numbers of student test submissions. Quiz Settings in WebCT and in other Learning Management Systems include, but are not limited to, restricting which IP addresses (or ranges) can access the quiz itself and setting a password for the quiz.

This chapter provides valuable information for teachers using WebCT. In addition to showing you how to create the different types of questions (multiple choice, short answer, matching, paragraph, and calculated), it demonstrates how to link to images and files. Linking to images can be done using the WebCT Graphic User Interface (GUI) or with HTML code. Linking to files can be done using the GUI or JavaScript. It concludes by looking at grading options for short answer questions.

For those of you who do not have access to, or do not wish to use, a quiz in a learning management system (LMS), there are other online assessment tools available. These third-party tools provide a variety of options, ranging from quizzes similar to those from an LMS to crossword puzzles that use vocabulary from your course. You can also create customized worksheets or include media like MP3 audio files. Some of these tools are free, while others require a subscription or fee.

The last section of the chapter discusses a different type of assessment, called authentic assessment. Authentic assessment is designed to give students the opportunity to show their abilities in ways that are closer to what they will be asked to do in the field they are studying. Usually multiple-choice quizzes do not provide the opportunity for students to show physical skills or higher level thinking. Essays, lab manuals, audio or video clips, observation logs completed by experts in the field, and presentations are just a few examples of evidence students can provide to demonstrate competencies. Sometimes these pieces of evidence are collected in an electronic portfolio, while in other cases they are individually submitted.

As an instructor it is your job to choose the appropriate assessment strategies for the knowledge, skills or attitudes that students need to display. Define your expectations, possibly with a rubric and model evidence that students should emulate. Pick a technology pathway that will provide equal opportunities for students to succeed. Finally, be sure to make assessment an iterative process. This can mean giving students a chance to go through a self-assessment quiz or to participate in a peer review exercise. It might also mean that you assign low-stakes quizzes or writing assignments each week. This will help students prepare to complete a high-stakes exam or written work.

References

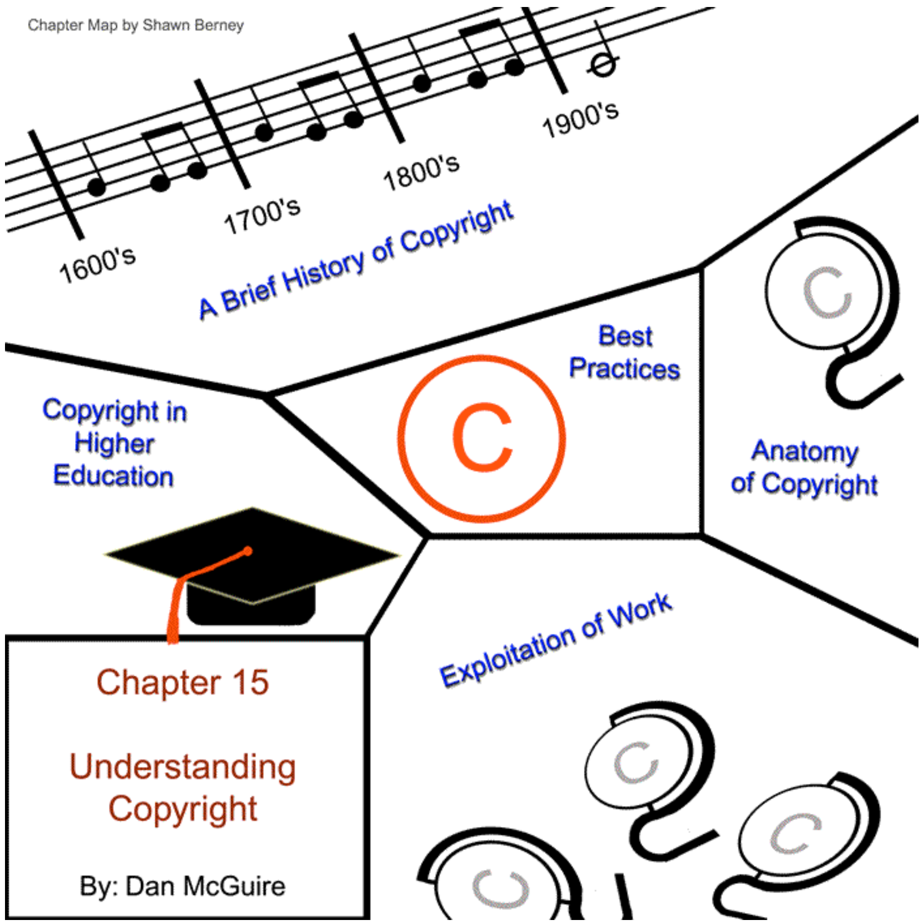
There is an online version of the WebCT quiz tool discussed in this chapter. It demonstrates the quizzes discussed here: http://webct.tru.ca/webct/ticket/ticketLogin?action=webform_user&WebCT_ID=oreilly01&Password=qwerty&request_uri=/webct/homearea/homearea

Benjamin Bloom's Learning Domains: http://www.nwlink.com/~donclark/hrd/bloom.html

Part 3: Implementing Technology

15
Understanding Copyright: Knowing Your Rights and Knowing When You're Right

Dan McGuire



Learning outcomes

After completing this chapter, you will be able to:

- Define "ownership", both as a concrete concept and as an abstraction, as a practical measure of property rights.
- Identify your rights as the owner of intellectual property
- Explain why seeking permission to use copyrighted material is preferable to using materials without permission.
- Identify some common instances of copyright infringement.

Introduction

Copyright is a word that has developed its own mythology.

It is almost impossible to go through a day without coming into contact with something protected by copyright. Music on the radio as we commute into work, the architecture of the home we live in, or the buildings we drive by, articles in the newspaper—you could safely say that almost every item we touch or interact with has some 'copyright' factor associated with it. With such a proliferation throughout our economy it's surprising just how often 'copyright' is misunderstood.

A Brief History of Copyright

EARLY HISTORY

The concepts underlying copyright protection have been around for at least 1500 years. The situation before the sixth century is a little unclear. Copyright has always been a response to technological change. The first such change was the advent of writing itself. Before writing, history was recorded through stories that were told and retold to succeeding generations. In the oral tradition it would not have occurred to anyone to restrict who could repeat the tales.

The first documented copyright dispute occurred in sixth-century Ireland. This isn't a tale of high priced lawyers arguing over minute details of the law—rather it is a tale of religion, power and bloodshed. In the early part of the sixth century Columba of Iona, a priest, borrowed a psalter from Finnian, and then diligently copied it page by page, though without asking Finnian for permission to do this. Finnian demanded the return of the psalter, and appealed to the Irish king Dermot, who ordered the copy be handed over to Finnian. When Columba refused to comply, Dermot used military force to see his judgment through. In the end, as many as three thousand men may have died.

While this tale certainly has all the elements of modern day copyright piracy, with the addition of armed conflict, it was not until much later that copyright issues came to the fore. St. Columba had to copy the psalter by hand, a very slow laborious process. Since very few people were literate, copyright wasn't much of an issue. It was not until the invention of the printing press that the idea of granting permission to make copies has any significance.

First laws

With the printing press it became possible to make multiple copies of books efficiently. Books became a commodity. Printing and selling books was soon a lucrative venture. At first the system of controlling the right to make copies was ad hoc. Kings and other rulers would grant the privilege of printing books to one printer or another. Books that were not authorized were banned. Printers who produced unauthorized works were arrested. Printers held a monopoly on the titles they printed. This system was clearly aimed at aiding the printers, as opposed to the authors. It was also a system that was ripe for corruption. It has been argued that one of the causes of the English Civil War was the monopolies handed out to his friends by Charles I.

The Statute of Anne, enacted in 1710 by the British parliament, is regarded as the first copyright law. This law placed the right to authorize the reproduction of a book not in the King's hands, but in the author's. This exclusive right lasted for 21 years, after which time the book entered into the public domain, and anyone would be free to copy it. The state of affairs in copyright remained relatively calm for the next two centuries. Book publishing increased in importance, both in society and within the economies of the world's nations. While printing technology improved, the process of publishing, and the state of trade in creative works remained largely the same.

Other nations took very different tacks in regard to copyright law. The United States of America, for example, entrenched the fundamental elements of their copyright law in their constitution.

TWENTIETH-CENTURY DEVELOPMENTS

While the 18th and 19th centuries were relatively stable in terms of copyright law, the 20th century saw a torrent of challenges, changes, and adaptations to the law. Technological change became a constant. Many of the technologies we take for granted today represented major challenges to the copyright status quo.

The invention of the photograph created a new, previously unimagined method of creativity, and generated an intense debate over the difference between a painting and a photograph. Was a photograph even a creative work? Was it not just a reproduction of that which already existed in nature, or was it analogous to a painter creating an impression of the same scene?

The ability to record musical performances opened a fresh can of copyright worms. For the first time there was an ability to 'fix' the performance, to store it and repeat the performance indefinitely. This raised questions about the rights of the composer, the performer, the recorder, and the distributor. For the first time, the idea of everybody owning a tiny slice of rights surfaced.

The idea of derivative rights was brought to us via the motion picture industry. This new form of expression was ripe for exploitation. The law was clear that one could not reproduce a novel or story in print, but what about adapting it into a movie? There was no law in this area, and so naturally the movie studios quickly delved into the libraries, adapting popular books for film. Book publishers of the day quickly moved to have the laws amended to block this loophole!

Other innovations included radio, television, and the photocopier. These minor challenges were essentially dealt with without legislative change to copyright law, as was one much more significant innovation.. The anticipated introduction, by Sony, of the home video tape recorder caused a great deal of consternation for television broadcasters. The VCR would allow the public to retain copies of their broadcasts for later viewing, or even sharing with friends and neighbours. Universal Studios sued Sony in an attempt to block the introduction of the VCR, and thankfully for everyone who has ever taped a television program for later viewing, they lost. The courts ruled that Universal Studios could not block the introduction of the VCR, which they acknowledged could be used to infringe copyright, because the device had significant non-copyright infringing uses. Had the VCR been intended only to reproduce copyright works it never would have seen the light of day as a consumer product. Today the sale or rental of movies for home viewing represents a major source of revenue for companies like Universal Studios.

All of these technological developments and adaptations of copyright law, either through the judiciary or through legislative change, were little more than a prelude to the challenges that arose in the late 20th century.

CONTEMPORARY SITUATION

At the beginning of the 21st century technological change has reached an amazing pace. New methods of communication, creation and transmission of ideas or works are introduced every day. New methods of exploiting creative works appear almost daily. Until recently, the technologies available to copy a work would not allow a perfect copy. A photocopy of a textbook is a poor substitute for the original, a tape made from a record is never as clear as one from the publisher. Now digital technologies allow for perfect (or near-perfect) copies—as many as are needed—to be transmitted around the world.

These technological innovations have re-opened the debates surrounding copyright protection. Given the ease of reproduction, some people have wondered about the relevance of copyright laws—proposing movement from a monetary economy to a gift economy, from competitive production to collaborative models. The open-source movement is a prime example of this debate. As a response to closed, proprietary software many software developers have moved to a model where the sharing is a requirement of distribution. Open source software licences permit the modification, distribution, and reproduction of the software without further permission or payment. The only requirement of these licences is that the same terms must be offered to any recipient of the code, and that the original source must be publicly accessible. Often described as an 'anti-copyright' movement, the open-source licences are entirely reliant on the existing copyright laws.

Anatomy of copyright

PROPERTY AND OWNERSHIP

Most people are familiar with the idea of ownership. We have all felt the pride of that first bicycle, or other prized childhood possession. But what exactly is ownership? This question has an easy answer: Ownership is the possession of property. This, of course, leads to the next question: What exactly is property? Again an easy answer comes to mind: Property is the stuff I own. There is no fundamental aspect that makes one object property, while another is not.

There is of course the idea of 'property' as a portion of land (real estate) which one person controls or possesses, probably the most important property we own. But of course the owner does not have complete control over his real estate. It is impossible to pick it up and move it to another location, and there are limits as to how the land may be used within any municipality.

Another form of property includes those items that can be moved, such as cars, computers, books, and pens. Ownership of a car is normally evidenced by registration of the title with some government agency, but what about the ownership of a pen? That form of ownership relies entirely on the mutual recognition of property rights. A pen is mine only because the other people in the room recognize it as my pen. Possession is 15/10ths of the law.

One of the key features of our modern society is the legal structure built up around the idea of property. Real estate is defined by law; my possession of a portion of land is granted by the government. Theft, fraud, trespass, vandalism are acts against property that have been forbidden by law. We accept these laws, largely without question, even when there may be valid reasons to refute them. Is someone who takes a loaf of bread from a store to keep from starving really a criminal? How about the person who paints anti-nuclear slogans on the side of a warship?

The laws relating to property have not been decreed by some dictator; rather, they have evolved to meet the needs of our society. Modern society has progressed from the time when possession of land was necessary for survival to a time when possessing tools for a trade could provide the income with which to buy the sustenance that land alone used to provide. Now we are in an age where most economic activity is cerebral—service and creative industries now dominate our economies. Similarly, laws have evolved that mirror this transition. During the last few centuries the concept of 'intellectual property' has been defined and developed.

A SIMPLE VIEW OF COPYRIGHT

Copyright is the right to copy, period. Such a simple statement could lead you to believe that any time you copy anything, even a small part of something you are infringing copyright. If it is impossible to do anything without infringing copyright then how relevant is the law?

WHAT COPYRIGHT PROTECTS

Copyright applies to, and protects, creative works. This includes the written word in literature, artistic endeavours such as painting or photography, the performing arts, and the combinations of these works in areas such as film or television.

Under international treaty, there is no requirement that a work carry any notice of copyright to be protected. This was the case for American copyright up until the 11576 Copyright Act. Today copyright protection is automatic, and applies from the moment an idea is 'fixed' into a tangible medium.

MORAL RIGHTS

For an artist or author, reputation is everything. In most countries copyright law includes provisions to protect the reputation of the author or artist. Nothing may be done to a work that reduces the reputation of the creator. This could include actions such as editing a work to give it a different character, altering a work of art to change its meaning, or including a work in a context that harms the reputation of the author. Moral rights may be waived, but they cannot be sold or transferred. In some nations moral rights are perpetual. In other nations they match the term of copyright protection. In some places they cease to exist when the author dies. In the US, there is no formal recognition of moral rights.

ECONOMIC RIGHTS

The main feature of copyright law is the commoditization of creative works. This is to say the creation of property-like rights in regard to creative works. Property is an often-misunderstood concept. Usually property refers to some physical, tangible object, which someone is said to own. My car, my pen—anything that begins with 'my' is usually considered a piece of property; that is, things that belong to me. John Locke stated that people have natural right to own the fruits of their labours. Taking this further, who else could own the thoughts of an individual? Copyright law makes it possible for artists and authors to record their creative thoughts and sell, rent, or lend them. This is clearly an economic issue—how are creative people within society rewarded for their labour?

INTERNATIONAL RIGHTS

Trade in cultural goods presents many interesting dilemmas. When a tangible product, such as a car, is traded between two nations, it is a simple matter. When a book is traded, it can become a very complicated transaction. Consider a situation where two nations do not recognize each other's copyright laws. In such a case if a single book is traded, it can then be reproduced by a publisher in the receiving nation and resold many thousands of times (assuming it is a good book). Of course the copyright owners may demand that no copies be traded with nations that do not recognize their rights, but enforcement of such a decree is next to impossible.

This situation was rectified in the late 19th century with the creation of the Berne Convention for the Protection of Literary and Artistic Works. This international treaty sets out basic conditions required in each member nation's copyright laws, as well as creating a system of international copyright law. The key concept under Berne is the idea of "national treatment". Under this term, a work is protected by the copyright laws of a given nation regardless of the nationality of its author. This means that an Australian author's works are protected by US copyright law in the US, just as an American author's works are protected by Australian copyright laws in Australia. This also means that a consumer of copyright works within a country need only understand the laws of their country. It is only when a project will be multi-national that the variations between copyright laws need to be examined.

Under the Berne convention, copyright protection must last for at least the life of the author plus fifty years. Copyright must apply to "every production in the literary, scientific, and artistic domain, whatever may be the mode or form of its expression" (Berne Convention 1886, Art. 2(1)). There must not be a formal process required for copyright protection, such as a requirement for a copyright notice. Currently 163 countries are members of the Berne convention, making it a near-universal treaty.

What copyright does not protect

Copyright is not absolute. There are many situations where copyright protection is either nonexistent or limited. The exceptions and exclusions to copyright law are critical tenets of the law.

Copyright is not a system of censorship. It is not intended as a tool to suppress debate or criticism. Unfortunately this principle has not always been adhered to. Copyright is not intended as a system to confine or restrain culture, although certain groups have attempted to do just that. Copyright law attempts to grant rights to the authors and artists, while balancing the rights of readers, art lovers, and other creators.

To be protected by copyright a work must be significant, not in terms of its impact on society, but in proportion to the entire work. A small quotation is not likely to be protected by copyright, unless of course it is the kingpin in an entire work. There is a story circulating regarding a request for clarification on what constitutes a significant portion of a work made to a major publisher. The response came back that every word copied from one of the publisher's books should be cleared before being re-used. The question then is, what about the word "the"?

FACTS

Copyright protects creative works; that is, it enables an author or artist to collect an income from their ideas. Facts have no author, or if they did, the author exercised no creativity. Facts are clearly not protected by copyright. But what if there is some form of creativity involved in the collection or presentation of those facts? In such a case the work in its entirety would be protected, but each underlying fact would still be unprotected.

IDEAS

Copyright protects the expression of an idea, not the idea itself. For a work to be protected it must be "fixed", that is, recorded in some physical form. Many of Disney's movies have been based on public domain fairy tales. From *Cinderella* to *Aladdin,* Disney has used these public domain tales as the basis for feature length animated films. If copyright law protected both the expression and the idea underlying the expression, then Disney would now hold rights to these tales. While Disney does hold certain rights to their creations, those rights are limited only to the exact expression fixed in their movies. Without this critical aspect it would be impossible to maintain any balance between creators and the public.

USES FOR THE "PUBLIC GOOD"

Most copyright legislation recognizes that certain uses of copyright material benefit society as a whole. Education is a classic example. The better educated a society is, the more well off its members can expect to be.

Criticism of a work or body is considered to be in the public good. It is considered beneficial to debate important issues; as well, it is often necessary to infringe the copyright of a person or persons to reveal their intentions to the public in general. The courts in many jurisdictions have recognized this and created jurisprudence that protects such uses. There are clauses in many copyright laws specifically stating that copying for the purpose of criticism is not a copyright infringement. Consider the difficulty in gaining permission from a copyright owner to use their work in a manner which will portray them in a negative manner. There have been cases where entire works have been reproduced, and the courts declared that no infringement occurred.

CHALLENGES

It is unfortunate that most of these exemptions are not stated as a positive right; rather they are defensive in nature. The best legal arguments may protect you in court, but they do very little to protect you from being brought to court in the first place. Many times a person has copied protected work in a manner that is fair, and in the public good, however when faced with a lawsuit from the rights holder they are forced to concede, and cease their use of the material. It's not the person with the legal right who wins, it's the person wit the deepest pockets.

Exploitation of a work

One of the best ways of understanding copyright protection is to know how copyright works can be exploited; that is, used for financial gain by the copyright owner. Here's a list of all the ways to use a work:

- **Copying:** This is the oldest form of exploitation of a work protected by copyright! This is the arena of book publishers, music distributors and film houses. The issue is fairly clear if we are talking about an entire work. The grey areas appear when we start talking about copying part of a work. If the law states that no part of a work may be copied, then what happens to cliché's? What about small quotations needed to make a point? What is the line between acceptable copying and copyright infringement?
- **Adaptation or derivatives:** This is a right that emerged in the late 19th and early 20th centuries. This is the right to take a work and create a new work based on it. This is the home of 'film rights' and the like. Examples would include making a movie from a book, or a sculpture from a painting.
- **Translation:** At times foreign markets demand a book or other work, when the artist has no intention of supplying it in the chosen language. It is often difficult to directly translate a work into a new language. This can lead to moral rights issues, if the translator is unable to properly relay the author's original intent.
- **Performance:** In music, the choice of orchestra, the choice of arrangement even the choice of instruments can greatly affect the resulting performance. Consider the plethora of cover tunes—some good, some bad, some horrid. It is clearly in the composer's interest to be able to control how their works are performed. In many cases it is the only way a composer can gain an income from their work.
- **Broadcast:** The advent of radio created a challenge to copyright laws of the day, not unlike the challenge brought by Napster and online file sharing. There is a tendency to believe that when one hears a song on the radio, it is being heard for 'free'. This is not the case, as radio broadcasters carefully record each song played and remit payment to the copyright owners for each broadcast. Of course radio broadcasters cover this fee through the sale of advertising.

Copyright in higher education

UNIQUE POSITION OF EDUCATIONAL INSTITUTIONS

The university is unique as both a creator and a consumer of copyright works. Most people are unaware of the many fees and licences that exist for the use of copyright works.

Issues relating to the use of copyright materials in teaching and learning are not new, in fact most materials have been used for so long we simply forget the underlying scheme that exists to pay the copyright fees. Many forms of copyrighted works—books, music, video, and sculpture are used in the modern university. These works are brought in for a range of purposes—for the entire student body, for specific faculties and schools, or for a specific course offering. Fees for the use of these materials are paid for by university departments, including the library, the faculties and schools, and by individual students. Table 15.1 demonstrates the matrix that describes this situation.

Table 15.1

	Individual Student	University Department	Faculty or School
Books	Bookstore—assigned texts For a given class. Brought in by the bookstore and resold to students. Goal is cost recovery.	Library—the library selects titles appropriate for the entire student body.	Library—certain library purchases may be made at the request of a specific school. While these books are available to the entire student body, they are of primary interest to that one school

	Individual Student	University Department	Faculty or School
Journal subscriptions		Library—the library selects titles appropriate for the entire student body.	Library—certain library purchases may be made at the request of a specific school While these books are available to the entire student body, they are of primary interest to that one school
Photocopies	Purchased by individual students, at self serve copiers. Paid for via cost recovery (machines) and Access copyright licence. Also supplied by the university bookstore/ reprographics on cost recovery basis.		Distributed to students in class, cost borne by department. Covered by Access copyright licence
Digital Assets	Included on CD/companion website, Cost borne by the student		

EXEMPTIONS AND THEIR IMPACT

Fair use, fair dealing and other exemptions are defenses in court, nothing more. This means that even with a solid argument for fair use, the copyright owner is still able to sue the user. Often the initial press regarding the case represents the greatest cost to the right's user, damaging their reputation and setting other rights holders' guards up against them. Add to this the cost of mounting a defense against such claims of infringement, and it is easy to see why most claims of copyright infringement are dealt with quickly and quietly.

STUDENT RIGHTS

Often students are unaware of their rights. They produce essays and term papers for submission to their instructors and then forget about them. The question of copyright is never considered. Most teachers know that examples of past work, both good and bad, can be an excellent aid to the learning process for current students. Presenting past student work is only legal if permission has been secured. This is easily done with a simple submission form where the submitting student can tick off what rights they are willing to grant the instructor or the school.

Best practices

KNOW THE LAW

There are two problems that occur when instructors are not familiar with copyright law. The first, and most worrisome for administrators is the infringement of copyright. When third-party materials are used without proper regard to copyright law, the institution is exposed to a serious liability. The damage from a copyright infringement case would not only be economic, as the institution would have to pay for a defense, but also the reputation of the institution would be damaged. The second problem occurs when instructors fail to use materials that would enrich the learning experience of their students simply because they believe copyright law prohibits such use, or that obtaining permission would be too onerous. This does a disservice to the students as well as to the authors and artists of our society.

PLAN FOR THE UNEXPECTED

Even in the best of circumstances things can go wrong. It is possible that a copyright owner may be unavailable to grant permission for some reason, or there may be reasons that prevent the author from granting permission, or you may run into a copyright owner who is simply not going to grant permission. Having a back-up to replace any work will be a huge benefit.

DOCUMENTATION

When using third-party material, keep careful records of where content came from, what steps have been taken to obtain permission and under what terms permission was granted. At a minimum, any correspondence with copyright owners, including any final licences, should be retained for as long as a work is used. It is also good idea to retain a record of research undertaken while trying to determine who owns the copyright.

CONSIDER THE BENEFITS

One of the side effects of seeking permission to use materials is the creation of a dialogue between creator and consumer of a work. Often, academic authors are only interested in how their works are used. By seeking permission you may also obtain access to unpublished materials, or higher quality copies. If there are any difficulties regarding the use of materials, if you have permission to use them you can go back to the rights holder for assistance. Imagine trying to do this for a 'bootleg' copy.

Glossary

Author. The original creator of a creative work.

Berne Convention.

Compilation. A collection of creative works, with a variety of rights holders.

Copyright owner. The person with the legal authority to authorize reproduction or other actions covered by copyright.

Derivative work. A new work based on a pre-existing one.

Fixation. Recording an idea or form of creativity in some tangible form.

Idea. The concept underlying a work

Infringement. Doing any of the actions under the control of the copyright owner without their authorization.

Licence: A document granting permission to perform one of the exclusive rights of the copyright owner in some limited form.

Medium. The format in which a work is fixed.

Moral rights. Those rights that relate to the reputation, or character of the author.

Permission. The positive response from a copyright owner. In most jurisdictions permission must be in writing.

Private. A family or close circle of individuals all known to each other, a location that is accessible only by a limited number of people.

Public. Any group of people who do not necessarily have any preexisting relationships in a location which any individual in society, or a large segment of individuals in that society may access.

Term. The length of time under which a work is protected OR the time span during which a permission or licence is valid.

Work. A fixed expression of a creative idea in some medium.

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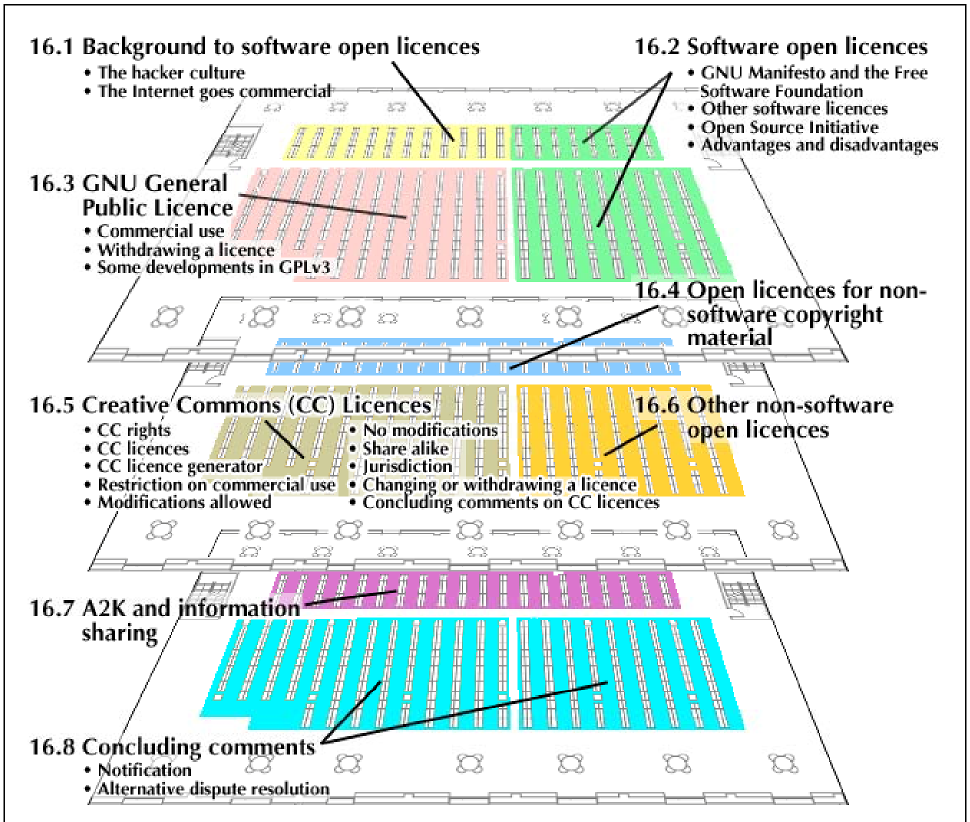
16
'Open Licences' of Copyright for Authors, Educators, and Librarians

Julien Hofman and Paul West

Free software is a matter of liberty, not price. To understand the concept, you should think of free as in free speech, not as in free beer. – The Free Software Definition (http://www.gnu.org/philosophy/free-sw.html)



Open Licence Library - Floor Plan

Learning outcomes

After completing this chapter, you will be able to:

- Understand what open licence software is about and start looking for an appropriate licence for software you are developing;
- Appreciate the advantages and disadvantages of using open licence software;
- Understand how open licensing for non-software educational material works;
- Appreciate the access to knowledge movement and what it aims to achieve.

Introduction

An open licence, as used in this chapter, is a neutral expression for a licence granted by someone who holds copyright in material allowing anyone to use the material subject to the conditions in the licence but without having to pay a royalty or licence fee.

There are many different open licences, some for computer software and some for other forms of material. Each has its own terms, conditions and vocabulary. This chapter is an introduction to open licence language and to the open licences that are important for authors and educators. It is not legal advice. Individuals or institutions thinking of committing themselves to open licensing should get professional legal advice about the implications of the licences they are considering using.

Supporters of the different licences do not always agree with one another. There are even extremists who, disliking the business practices of some commercial software suppliers and publishing houses, want to use open licences to do away with restrictions on using copyright material. Despite the understandable wish of some open licence supporters to reform copyright law, open licences are legal tools that use the existing copyright law. They rely, in particular, on the exclusive right copyright law gives a copyright holder to licence material with an open licence or any other form of licence.

The chapter starts by looking at software open licences. Software developers working on open licence software will need a more detailed explanation of the different open licences than they will find in this chapter. But even authors and educators with no pretensions to ICT expertise depend on operating systems, word processors, communication packages and online learning software. This part of the chapter aims at providing such users with an introduction to open licence software and its advantages and disadvantages.

Understanding software open licences is also a good introduction to the open licences that apply to other materials and, in particular to Open Educational Resources (OERs). The second part of the chapter looks at these open licences and, in particular, at the Creative Commons licences. The chapter ends by looking briefly at the Access to Knowledge (A2K) movement that aims at making all forms of information more freely available.

Software open licences

THE HACKER CULTURE

Open software licences had their origins in what Eric Raymond calls the hacker culture. (Eric Steven Raymond *How to Become a Hacker* 2001, latest revision 2007, http://www.catb.org/~esr/faqs/hacker-howto.html). For Raymond and those who work with open licence software "hacker" has its original meaning of a committed software developer. It does not refer to a criminal who breaches computer security. Hackers share their discoveries and feel free to use the work of other hackers. This leaves hackers free to work on unsolved problems rather than waste creative energy repeating what others have done. Hackers who publish their work, either on the Internet or in other ways, have copyright in it. At first, however, few hackers bothered with copyright. Some were not even concerned with their moral rights, the right to be recognised as the author of original material.

It is not clear how to understand this in terms of copyright law. It could have been argued that this behaviour reflected or created a trade custom among hackers. Or, because hackers often used the Internet to share work, it could have been taken as evidence of an implied licence that allowed members of the Internet community to use material on the Internet without permission. Certainly, many early Internet users assumed that they were free to use anything they found on the Internet. But it is doubtful that these arguments would have served as a defence if an author had sued for breach of copyright. The second argument reverses the usual legal position in which a copyright holder has to licence another to use the copyright holder's work. And with both arguments it would have been difficult to establish the terms of the licence or custom and who qualified as a member of the community to which it applied. But whatever the exact legal position, this was how it was when software developers were mostly academics or researchers who often used the Internet to share scientific or technical information.

Some developers did claim copyright in software they developed. They did this by making their products available as freeware or shareware. Freeware is copyright material which the copyright holder allows others to use without charge. Shareware is copyright material which the copyright holder allows others to use subject to a small charge or condition. Freeware and shareware are not the same as open licence software because they do not envisage users continuing to develop and distribute the material.

GROWTH OF COMMERCIAL SOFTWARE

Some of the lack of interest in ownership in computer software may have been because, in the early days of computers, the software was not seen as distinct from the computers on which it ran. But as computers for ordinary users became popular, particularly after the launch of the IBM PC in 1981, it became clear there was a separate market for software for these computers. This market grew as personal computers became more powerful and able to run more complex software. And it received another boost when, towards the end of the 1990s, ordinary users began to access the Internet through the World Wide Web. From the 1970s onwards most countries recognised copyright in software and in 1996 the WIPO Copyright Treaty made it clear that software fell under copyright law. Some commercial software developers became very wealthy from licensing the software they had developed. Some countries have even taken the controversial step of giving software added protection by allowing software patents.

Today businesses are always looking out for new and useful software. If they can acquire rights over the software they will invest in marketing it. When they do this they usually allow only those who pay their licence fee to use the software. And they do not usually allow users access to the software's source code. Source code is the human-readable version of the software used to create the computer program. Restricting access to the source code means that in practice only the software owners can develop the software. Software of this sort is known as "closed software" or "proprietary software".

SOFTWARE OPEN LICENCES

The hacker community and those who sympathised with their ideals saw the possibility that all software would become closed or proprietary. To stop this happening they developed open licences of which the following are some of the more important.

BSD licences

The Berkeley Software Distribution (BSD) licence was developed by the University of California, Berkeley and first published in 1989. But some of the BSD software goes back to 1977 and the BSD licence is said to embody the conditions under which this software was released. This means the BSD licence may have been the earliest open licence. Some important software is available under BSD licences including the software that runs many domain name servers and a Unix-like operating system.

Different versions of the BSD licence have developed. BSD licences have few restrictions on how the software may be used. They differ from the GPL, discussed below, in not insisting that developments of BSD software be distributed on the same terms and in not insisting that source code be made available to those to whom the object code is distributed.

GNU licences

Richard Stallman is a prophetic figure who campaigns for free alternatives to commercial software and, in particular, for a free alternative to the Unix operating system that AT&T, the US telecommunications giant, developed. In 1985 Stallman published the GNU Manifesto (GNU standing for Gnu's Not Unix) setting out his ideals and established the Free Software Foundation (FSF) to support this work.

In 1989 Stallman published the first version of the GNU General Public Licence (the GPL). There is also a GNU Lesser General Public Licence (LGPL) that allows for linking GPL software and software not published with the GPL and a GNU Free Documentation Licence (FDL) for software development documentation and manuals. The GPL is now in its third version and, about three-quarters of the world's open licence software uses the GPL. This software includes the Linux operating system, an alternative to Unix, that Linus Torvald released under the GPL in 1991. The following are some of the main features of this important licence.

A powerful (and contentious) feature of the GPL is what Stallman calls "copyleft". Copyleft, shown by a reversed © symbol, means that others are free to develop a GPL work on the condition that any work derived from a copyleft work is distributed subject to a similar condition. This means the GPL licence is what some call "viral", it tends to take over software originally published under other open licences.

Another feature of the GPL is that GPL software must be conveyed with its source code. This is to make it easier to develop the software. Not every open licence requires this.

To those who think of software open licences as anti-commercial, a striking feature of the GPL is the absence of restrictions on using GPL software to make money. As the preamble to the GPL puts it: "Our General Public Licenses are designed to make sure that you have the freedom to distribute copies of free software (and charge for them if you wish) …" In the past few years this has begun to happen. Red Hat, for example, is a company listed on the New York Stock Exchange. It develops and distributes a version of Linux, Red Hat Enterprise Linux. Since 2002 IBM has been offering this as an operating system for IBM computers. Dell, a major supplier of personal computers, has previously offered its computers with Linux operating systems and is now selling some computers with Ubuntu Linux. Even a corporation like Novell that sells software rather than computers, is using a version of Linux, SUSE Linux, as an operating system.

The advantage to these and other corporations of using open licence software is that they do not have to develop this software themselves or pay licence fees for software others have developed. They get the benefit of the work independent developers put into open licence software and can concentrate on improving the products or applications that are their speciality. In return, independent developers get access to the work these corporations put into adapting open licence software. Open licence developers are also well qualified to work for the corporations and provide support to the corporations' clients. They are even free to market the software on their own account.

The growth of the commercial use of open-licence software has not stopped individuals and groups supported by not-for-profit organizations from continuing to develop GPL software. The Shuttleworth Foundation, for example, has sponsored Ubuntu Linux. Ubuntu Linux is meant to be easy for non-technical people to use and, in particular, supports other languages than English. It is this version of Linux that Dell is offering on its personal computers. Ubuntu also has a commercial sponsor, Canonical Ltd, that provides training and support for Ubuntu users.

As already mentioned, anyone who acquires GPL software and develops it may only distribute the developed software under the GPL. But someone who develops original software, meaning here software that is not a development of other software, is free to decide how to licence it. Such a developer is free to use more than one licence. So software may be distributed under the GPL and another open or proprietary licence. This raises the question whether someone who develops original software and distributes it with a GPL licence may withdraw the GPL licence? Because the GPL is perpetual anyone who acquires a copy of original software from the developer under the GPL is free to continue to use the software. It is not entirely clear whether the developer can prevent those who have already acquired the software from passing it on to others. But it is clear that the GPL does not require a developer to continue to distribute software and this may make it difficult for others to acquire the software. In addition, the GPL does not require the developer of original software to offer further developments of the original software under the GPL. By not offering further developments under the GPL the developer of the original software will lessen the attractiveness of the earlier GPL version.

The GPL came out in 1989. A second version, GPL version 2, came out in June 1991 and GPL version 3 in June 2007. Version 3 has two interesting new provisions. The first is in clause 11 dealing with the GPL and patent rights. The other is in clause 3: "No covered work shall be deemed part of an effective technological measure under any applicable law fulfilling obligations under article 11 of the WIPO copyright treaty adopted on 20 December 1996, or similar laws prohibiting or restricting circumvention of such measures". This means a person is free to remove coding of this sort if it appears in GPL software.

Other software licences

Some software developers use other open source licences. They may do this because they want to avoid the copyleft restrictions in the GPL that make it difficult to use the software commercially or because they do not want to require licencees to distribute the source code. Or they may have to use another licence because the software on which they are working began with a different licence. The following are some examples of other software open licences and how they came about.

Sendmail is a widely used program for managing email that was first published under a BSD licence. In 1999, following difficulties in developing and supporting the software as an open licence product, a company was formed to do this commercially while leaving the software available under an open licence. This called for changes to the BSD licence that resulted in the sendmail licence. The sendmail licence, it has been pointed out, is not listed as an open source licence at the Open Source Initiative website discussed below.

Netscape, on the other hand, was a commercial software developer that produced the influential Navigator web browser and Communicator email software. Following competition from Microsoft's Internet Explorer, Netscape decided to release the source code for these products under an open licence while continuing to develop the software commercially. To enable them to do this they produced they Mozilla Public Licence. The successors to Navigator and Communicator, Firefox and Thunderbird, use this licence. Other developers, particularly by those who want to have both commercial and open licence versions of their software, also use this licence.

The Apache Software Foundation has its own model for software development that has resulted in non-GPL licences. The Foundation grew out of a community of developers who, around 1995, were working on projects that included the important Apache HTTP Internet server. According to the Apache Foundation website: "All software developed within the Foundation belongs to the ASF, and therefore the members".

OPEN SOURCE INITIATIVE

As the number of open licences has grown so it has become difficult for non-specialists to understand the differences between them. In 1998 the Open Source Initiative (OSI) was founded to be "the stewards of the Open Source Definition (OSD) and the community-recognized body for reviewing and approving licences as OSD-conformant" (http://www.opensource.org/about). The OSD is a list of 10 requirements that software must meet to qualify as open source.

The Open Source Initiative keeps a list of licences it considers comply with its definition of open source. It has a trademarked logo that those whose licences comply with the definition can use. It might seem it should be possible to use any OSD-compliant software with any other OSD-compliant software. This, however, is not always the case as some of the licences contain incompatible terms.

ADVANTAGES AND DISADVANTAGES OF OPEN LICENCE SOFTWARE

Traditionally open licence software users were technically sophisticated. They probably shared the ideals of organizations like the Free Software Foundation and may even have helped develop the software they used.

Increasingly, however, open licence software users have little or no technical expertise. They simply want to save money by switching to open licence software rather than pay for commercial software from suppliers like Microsoft. Stand-alone products like open licence products like Firefox and Thunderbird should present these users with few difficulties. But non-technical users are likely to resent having to learn how to use the more complex products that are an alternative to Microsoft Windows and Office. In addition, some of the proprietary software on which an individual or institution depends may not may not be easy to run with open licence software or be available in an open licence version. Open licence software is also likely to need as much support as the equivalent commercial software. Support here means help with installing the software, manuals, training for users and access to experts. Before committing themselves to open source software, users with little technical expertise should check these points and, in particular, be sure adequate support will be available and know what it will cost. Businesses using open licence software should also bear in mind that most open licences disclaim liability for any damage resulting from the software. They may need to consult their insurers.

It is worth noting that some software managers working in higher education institutions have reservations about using open licence software for sensitive data. Their concern is that if the source code is available it is easier to attack the software and publish, change, or destroy the data.

Open licences are popular among educators. But individuals and institutions that distribute their original software with an open licence may be giving up the possibility of royalty revenue from those who use their software. They need to weigh this against the advantages of open licensing and the possibility of exploiting their software in other ways. They should also be aware, as has been mentioned, that they have the option of licensing the software with an open and a proprietary licence.

Open licences for non-software material

The success of open licence software led to an interest in using open licences for non-software material and especially for educational and scientific material. The list of individual and institutional signatories to the Cape Town Open Education Declaration of 2007 (http://www.capetowndeclaration.org/) shows how much support there is for open licence educational resources (OERs).

EARLY OPEN LICENCES

Open licences for non-software material came some time after open licences for software. The earliest such non-software open licence may have been the Open Content Licence that David Wiley of Open Content published in July 1998. The following year, in June 1999, the Open Content Project published the Open Publication Licence.

GNU FDL

In March 2000 the Free Software Foundation released version 1 of the GNU Free Documentation Licence (the FDL). The FDL was meant for software developers writing manuals and documenting their work but it can be used for other forms of material. Wikipedia, for example, uses the FDL. A revised version, FDL version 1.2, appeared in November 2002 and the Free Software Foundation is working on version 2. The FDL, like the GPL, allows for commercial publishing. If, however, the GNU website list of 30 or so commercially published FDL books is complete (http://gnu.paradoxical.co.uk/doc/other-free-books.html), FDL material is not yet as attractive to commercial publishers as the GPL software is to commercial software developers.

CREATIVE COMMONS LICENCES

Open licences for non-software material began to attract serious attention in 2001 when Lawrence Lessig and others started Creative Commons (CC). The CC licences are now the most important open licences for non-software material.

CC rights

The CC licences are based on the CC analysis of copyright rights. This distinguishes between four rights of a copyright holder. The CC website lists and explains these rights:

> “Attribution. You let others copy, distribute, display, and perform your copyrighted work—and derivative works based upon it—but only if they give credit the way you request.”
>
> “Noncommercial. You let others copy, distribute, display, and perform your work—and derivative works based upon it—but for noncommercial purposes only.”
>
> “No Derivative Works. You let others copy, distribute, display, and perform only verbatim copies of your work, not derivative works based upon it.”
>
> “Share Alike. You allow others to distribute derivative works only under a license identical to the license that governs your work.”

All the CC licences include what CC calls the “Baseline Rights”. These are the rights to copy, distribute, display, perform publicly or by digital performance and to change the format of material.

CC licences

In theory the four CC rights, used singly or combined, allow for eleven different possible licences. In practice CC offers only six licences. These licences allow copyright holders to grant users different combinations of the CC rights. This flexibility makes the CC licences more attractive to authors than the all-or-nothing open licences that are usual for software. As the CC website says:

> Creative Commons defines the spectrum of possibilities between full copyright—all rights reserved—and the public domain—no rights reserved. Our licenses help you keep your copyright while inviting certain uses of your work—a “some rights reserved” copyright.

The CC website has a diagram that shows the spectrum from copyright to public domain with CC licences occupying the space between these two:

CC also takes into account that copyright law differs from country to country. As well as a generic or unported version of each licence CC aims at providing a version, in the appropriate language, adapted to the law of each country where the CC licences are used. This means there is no one CC licence in the way there is one GNU GPL. With CC licences it is always necessary to specify which national version of the CC licence is being used, and, in some cases, the language version of the licence.

In addition to the CC licences, CC provides a form for an author to place a work in the public domain. This is only legally possible in some countries. CC also has a procedure for recreating the original US copyright term of 14 years.

CC uses symbols and abbreviations to represent the four rights of a copyright holder and combines these symbols and abbreviations to represent the different licences. The names, abbreviations, and symbols of the six CC licences give some idea of the complexity of the CC licence system:

- Attribution Non-commercial No Derivatives (by-nc-nd)
- Attribution Non-commercial Share Alike (by-nc-sa)
- Attribution Non-commercial (by-nc)
- Attribution No Derivatives (by-nd)
- Attribution Share Alike (by-sa)
- Attribution (by)

CC licence generator

The text of the CC licences and their different language versions is on the CC website. The CC website does not, however, expect users to study every licence before choosing one. Instead, there is a licence generator that suggests the appropriate CC licence based on the answers to following three questions:

- Will an author allow commercial use of the work?
- Will an author allow users to modify the work? (Included under this question is the possibility of allowing users to modify the work if they share alike.)
- In which jurisdiction does an author want to license the work?

The questions are a convenient starting point for commenting on the six CC licences.

Jurisdiction

It is useful to start with the third question on the jurisdiction of the licence. If a work will be used mainly in one country an author should select that country. If an author is publishing a work internationally or if there is no licence for the country in which the author is publishing, the author should answer 'unported'. The unported version of a licence is a generic, international licence. The following discussion of the other questions will refer to the unported versions of the licences.

Restriction on commercial use

The first question the licence generator asks is: "Allow commercial use of your work?" If the copyright holder does not want to allow commercial use of the work the licence generator suggests a non-commercial (NC) licence. What this means is that a copyright holder who finds individuals or institutions making commercial use of the work can take legal steps to stop them doing this. But what does non-commercial mean? Section 4b of the unported CC Attribution-NonCommercial 3.0 licence says:

> You may not exercise any of the rights granted to You in Section 3 above in any manner that is primarily intended for or directed toward commercial advantage or private monetary compensation. The exchange of the Work for other copyrighted works by means of digital file-sharing or otherwise shall not be considered to be intended for or directed toward commercial advantage or private monetary compensation, provided there is no payment of any monetary compensation in connection with the exchange of copyrighted works.

One view of what this means, often forcefully expressed in workshops and discussion groups, is that non-commercial means that no money should change hands. This is not, however, the usual meaning of non-commercial. It is not a commercial transaction, for example, to refund someone for buying me a loaf of bread or even to pay that person's travelling expenses. It only becomes commercial if that person wants to make a profit out of providing this service. It follows that someone who distributes an NC work should be able to charge to recover expenses incurred in distributing the work. These expenses, typically, would include copy charges, salaries and overhead expenses. The only restriction is that anyone doing this does not intend to make a profit out of distributing the work. This is the view of the Draft Guidelines that CC published to try to clarify the meaning of non-commercial. ("Proposed best practice guidelines to clarify the meaning of 'noncommercial' in the Creative Commons licenses" available at http://wiki.creativecommons.org/DiscussionDraftNonCommercial_Guidelines)

There is still some uncertainty, however, about what "primarily intended for or directed toward commercial advantage or private monetary compensation" in section 4b means. It could be argued that even if a project does make a profit, the use is still non-commercial if the project was *not primarily intended* to make a profit. According to this view, an organization that is run for profit may use NC material and may recover its expenses for distributing NC material provided the *project* using the NC licensed material does not aim at making a profit.

This raises questions such as whether private schools run for profit or public broadcasters that accept advertising revenue may use NC-licensed material for teaching or informing their viewers? (See Mikael Pawlo, "What is the meaning of non-commercial" in Danièle Boucier & Mélanie Dulong de Rosnay, International Commons at the Digital Age: La création en partage 2004 Romillat, Paris 69 at 78–82. Available at http://fr.creativecommons.org/iCommonsAtTheDigitalAge.pdf) Another question is whether a business whose profits support a non profit body such as a university may use NC material. The Draft Guidelines appear to prohibit using NC material in these ways. Section C(2) of the Draft Guidelines, for example, says that it is not non-commercial if money changes hands to, for example, a for-profit copy shop. Section A(1)(b) insists that an educational institution or library using NC material must be nonprofit. And section B appears to classify as commercial any use of NC material in connection with advertising.

What the Draft Guidelines say, however, does not settle the matter. The Draft Guidelines are not part of the NC licence. As section 8e of the NC licence says: "This License constitutes the entire agreement between the parties with respect to the Work licensed here." And a notice at the end of the licence says "Creative Commons is not a party to this License, and makes no warranty whatsoever in connection with the Work." The Draft Guidelines themselves do not claim to be an authoritative. CC published them to "elicit feedback about whether these guidelines accurate reflect the community's (including both licensors and licencees) understanding of the term". This means that what the Draft Guidelines say should be treated with respect but any dispute between a copyright holder and a user can only be settled on the basis of what the licence says. This raises the question whether any ambiguities in the wording of the licence should be interpreted strictly, to limit the use of NC material, or generously, to allow the widest use of a work.

CC plans to return to the question of the meaning of non-commercial. It would be helpful to know what authors who use the NC licence really want to achieve. They do not want royalties for their work but they do, presumably, want the work to be made widely available. If these authors object to associating their work with commerce in any way, the Draft Guidelines should be followed. If, on the other hand, these authors want only to avoid commercial interests taking over and restricting access to their work, the authors may be prepared to allow their work to be used by organizations or individuals working for their own profit provided they do not limit further distribution of the CC work. And this could be achieved by using a SA ShareAlike licence.

As with all the CC licences, it is always possible for a commercial user to approach the author of a work directly and ask for permission to use CC licensed work in a way the CC licence does not cover.

Modifications allowed

Once a user has decided whether to allow commercial use, the licence generator's second question is: "**Allow modifications of your work?**" There are three possible answers to this question: "Yes", "No", and "Yes as long as others share alike".

Particularly where the licensed material is educational material, users are likely to want to modify it by adding examples and other material, by translating it into another language or adapting it in some other way. The licence generator will suggest that those who want to allow users to modify their material use either a simple attribution (BY) licence or an attribution non-commercial (BY-NC) licence. Which it suggests will depend on the answer to the first question: "Allow commercial use of your work?"

The simple attribution licence, not combined with a NC restriction, allows a user to do anything with the material except claim copyright in it or authorship of it. A user may modify the material or leave it as it is and market the modified or original material commercially and keep any profit.

No modifications

If the answer to the licence generator's second question "**Allow modifications of your work?**" is "no", the licence generator will suggest an ND (no derivate works) licence. The human readable summary of version 3 of the unported Attribution-NoDerivs licence says: "You may not alter, transform, or build upon this work.". The legal code prefers to speak of not adapting a work. Section 1a defines adaptation as:

> a work based upon the Work, or upon the Work and other pre-existing works, such as a translation, adaptation, derivative work, arrangement of music or other alterations of a literary or artistic work, or phonogram or performance and includes cinematographic adaptations or any other form in which the Work may be recast, transformed, or adapted including in any form recognizably derived from the original, except that a work that constitutes a Collection will not be considered an Adaptation for the purpose of this License. For the avoidance of doubt, where the Work is a musical work, performance or phonogram, the synchronization of the Work in timed-relation with a moving image ("synching") will be considered an Adaptation for the purpose of this License.

This means that a ND licence allows users to use, reuse and distribute a work but not adapt it.

There are situations where an ND restriction is necessary. If a work is a report or set of standards, it makes sense to insist that it is only used in its original form. Changes to a work of this sort destroy its value. Even valid corrections can be harmful because they give readers a false impression of the accuracy of the original report.

The ND restriction is also necessary if an author wants to distribute a work for comment while reserving the right to publish the final version of the work.

Some educators dislike the ND restriction and say it makes it difficult for them to use material most effectively. But the ND licence does allow for an ND work to be used in a collection. (Some versions of the ND licence call this a collective work.) Section 1b of the legal code defines a collection as:

> a collection of literary or artistic works, such as encyclopedias and anthologies, or performances, phonograms or broadcasts, or other works or subject matter other than works listed in Section 1(f) below, which, by reason of the selection and arrangement of their contents, constitute intellectual creations, in which the Work is included in its entirety in unmodified form along with one or more other contributions, each constituting separate and independent works in themselves, which together are assembled into a collective whole. A work that constitutes a Collection will not be considered an Adaptation (as defined above) for the purposes of this License.

This means that provided the ND work is reproduced whole and unmodified it can be published in a collection with a commentary or other relevant material. It is not clear whether it would be permissible to use hyperlinks to take a user directly to parts of an ND work or to connect an ND work to a commentary or other material.

Section 4 of the legal code goes into detail about how an ND work can be incorporated into a collection and how the work must be credited. It is possible to assemble a collective work consisting of materials carrying different licences. A collection may also, if it is sufficiently original, qualify for copyright protection and for its own licence which does not have to be an ND licence. When this happens the collective work's licence will not change the licences attaching to the components in the collective work.

Share Alike

If the answer to the licence generator's second question "**Allow modifications of your work?**" is "Yes, as long as others share alike" the licence generator suggests a share alike (SA) licence. This ensures that modified works based on the licensed material are available to others under the same conditions as the original work. The share alike licence offers authors the possibility of making their work "viral" in a way that is similar to the GPL. Version 3 of the unported of the Attribution-ShareAlike licence says:

> You may Distribute or Publicly Perform an Adaptation only under the terms of: (i) this License; (ii) a later version of this License with the same License Elements as this License; (iii) a Creative Commons jurisdiction license (either this or a later license version) that contains the same License Elements as this License (e.g., Attribution-ShareAlike 3.0 US); (iv) a Creative Commons Compatible License.

The CC's symbol for share alike is almost exactly but not quite the same as the FSF's symbol for copyleft.

Attribution

All the CC licences require what CC calls attribution. The human readable summary of version 3 of the unported Attribution licence explains what attribution means:

> You must attribute the work in the manner specified by the author or licensor (but not in any way that suggests that they endorse you or your use of the work)

Changing or withdrawing a licence

The CC licences all say the licence is for the duration of copyright and only ends if the person holding the licence breaks the terms of the licence. Section 7b of version 3 of the unported Attribution licence, for example, says:

> Subject to the above terms and conditions, the license granted here is perpetual (for the duration of the applicable copyright in the Work).

Whether an author can stop those who have not begun using the material, from acquiring rights in terms of the original licence is an awkward question. Section 8a of the licence suggests that an author cannot do this:

> Each time You Distribute or Publicly Perform the Work or a Collection, the Licensor offers to the recipient a license to the Work on the same terms and conditions as the license granted to You under this License.

There is a problem with this clause in that the identity of the "relevant third party" is unknown until someone begins to use the work. This means that an author is bound to an uncertain person. Not every legal system accepts that this is possible. If an author does withdraw a licence this will not affect the rights of those who had previously begun to use the material.

Concluding comments on CC licences

There was no CC equivalent to the GNU Manifesto although there is now a "*Free Content and Expression Definition*" that may serve as a manifesto. It seems, however, that what the founders of the CC movement had in mind was a community producing material that it would make available under the CC licences in the same way as there are communities of software developers. making software available under different licences. There two features of the CC licences that might hinder this.

First, the system of CC licences is complex and, as has been shown, the meaning of the licences is not always clear. A pre-publication review of this chapter advised against publishing some of the comments for fear that they might weaken confidence in the CC licences. It seems, however, that long-term confidence in the CC licences will only be possible when difficulties of the sort this chapter raises have been resolved.

Second, and possibly more importantly, authors and educators 'need to eat'. Those in regular employment and those supported by public or private grants may be happy to use the CC licences. But authors earn their living from their work might be reluctant to use the CC or any other open licence. Commercial publishers, whether they publish traditionally or online, are unlikely to want to pay authors for the rights to publish a work that is already freely available. And it is difficult to see how there could be a commercial use for non-software open-licence material in the way there is for open licence software.

OTHER NON-SOFTWARE OPEN LICENCES

Some authors draft what are, in effect, their own open licences. This can be done quite simply. So, for example, the copyright notice on the Antiquarian Horological Society's Website (http://www.ahsoc.demon.co.uk/) reads:

> The material in these pages is copyright.
> © AHS and Authors. 1996 – 2007.
> The information may be downloaded for personal use only. The information may be passed on to another party for their private use provided that the source and this copyright information is acknowledged. The material may not be reproduced in quantity, or for commercial purposes.

Open licence drafting, however, is not always a simple matter and not every home-grown licence is free of problems. The United Nations Disaster Management Training Programme, for example, has the following licence on some of its training material:

> The first edition of this module was printed in 1991. Utilization and duplication of the material in this module is permissible; however, source attribution to the Disaster Management Training Programme (DMTP) is required.

In this licence it is not clear whether 'utilization and duplication' includes making derivative works and using the material commercially for profit.

The African Medical Research Foundation, to take another example, has licensed some of its educational material with CC Attribution-Share Alike licence. The Foundation then goes on to explain that copying, reproducing and adapting the material is "to meet the needs of local health workers or for teaching purposes". It is not clear if this limits the CC licence. The Foundation also asks, although not as a term of the licence, for feedback on how the material is being used:

> This course is distributed under the Creative Commons Attribution-Share Alike 3.0 License. Any part of this unit including the illustrations, may be copied, reproduced or adapted to meet the needs of local health workers or for teaching purposes, provided proper citation is accorded AMREF. If this work is altered, transformed or built upon, the resulting work may be distributed only under a license identical to this one. AMREF would be grateful to learn how you are using this course, and welcomes constructive comments and suggestions.

Access to knowledge and information sharing

There is a growing awareness of the importance of access to knowledge and information and of the need to prevent commercial exploitation from making important knowledge the preserve of relatively few. An example of this was President Clinton's decision to increase funding for the Human Genome Project to ensure that the sequences were not patented and limited to commercial use. When discussing access to knowledge it is useful to distinguish different kinds of knowledge or information.

Governments have detailed information about matters such as the health, safety and education of the population, trade figures, economic performance, spatial information and geodata. They collect this information for their own purposes and, in terms of the law of most countries, they have copyright in it. Such information, of course, is often also useful to researchers and commentators and to those thinking about investing in the country either to make a profit or to help development. There is, however, no single approach about whether and on what terms this information should be available.

In 2005 Brazil and Argentina proposed to the World Intellectual Property Organisation that the organization's development agenda should discuss the possibility of a Treaty on Access to Knowledge (A2K). Much of the draft of the treaty deals with widening the scope of the exceptions to and limitations on the copyright holders' rights. Part 5 is entitled "Expanding and enhancing the knowledge commons" and includes articles providing for access to publicly funded research and government information and a provision that government works should be in the public domain.

A category of government information to which some countries already allow access is material of a legal, judicial or political nature: legislation, case law, and parliamentary proceedings. In 2002 delegates from some Commonwealth countries produced a 'Declaration on Free Access to Law' that asserts, among other things that "(p)ublic legal information is digital common property and should be accessible to all on a non-profit basis and free of charge; …" Anyone who has followed the discussion in this chapter and reads the full declaration will realize that the declaration needs to go into more detail about creating derivative works and using the material commercially.

Tax exempt foundations and not-for-profit educational and research institutions also fund research that produces important information. According to the law in most countries, funders and employers can decide on what terms to release this information. It is understandable that researchers looking for funding may want to include a profit line from intellectual property in their research proposals. Educational institutions also like the idea of using the research done by their staff to produce what some call "third stream" income. It could also be seen as part of academic freedom that academics who work in educational and research institutions are entitled to a say in how their research is released. Access to knowledge advocates could argue that governments should consider whether institutions and funders that do this are really entitled to their tax-free status.

Creative Commons works through Science Commons to encourage the free flow of scientific information. One of the Science Commons projects has drafted model contracts for the transfer of biological material. Another project aims at publishing material that is important for biological research with an open licence. A third project aims at getting peer reviewed journals to publish with open licences and enlisting academics to publish only in journals that do this.

Concluding comments

In conclusion it seems worth mentioning two features that most open licences lack: provision for notifying the copyright holder about how material is being used and provision for alternative dispute resolution.

NOTIFICATION

It is surprising that open licences do not allow an author to require a user, in return for being free to use the author's material, to keep the author informed about what a user does with the material. The African Medical Research Foundation's licence requests this information but it is not a condition of using the material. Drafting such a condition, of course, would have to be done so as not to impose too much of a burden on users. But if it could be done the information would help assess the value of open licence material.

ALTERNATIVE DISPUTE RESOLUTION

We have seen the different opinions about what some of the clauses in the CC licences mean. And there has been litigation about the meaning of the GPL. As things stand only a court, possibly even a whole series of courts in different countries, can settle differences of opinion. Given the cost of litigation, it is unlikely that the courts will ever have an opportunity to do this. In 1999 ICANN adopted a Uniform Domain-Name Dispute-Resolution Policy for settling disputes about domain names. There is no reason why there should not be a similar dispute resolution procedure for settling disputes between copyright holders and users about the meaning of open licences.

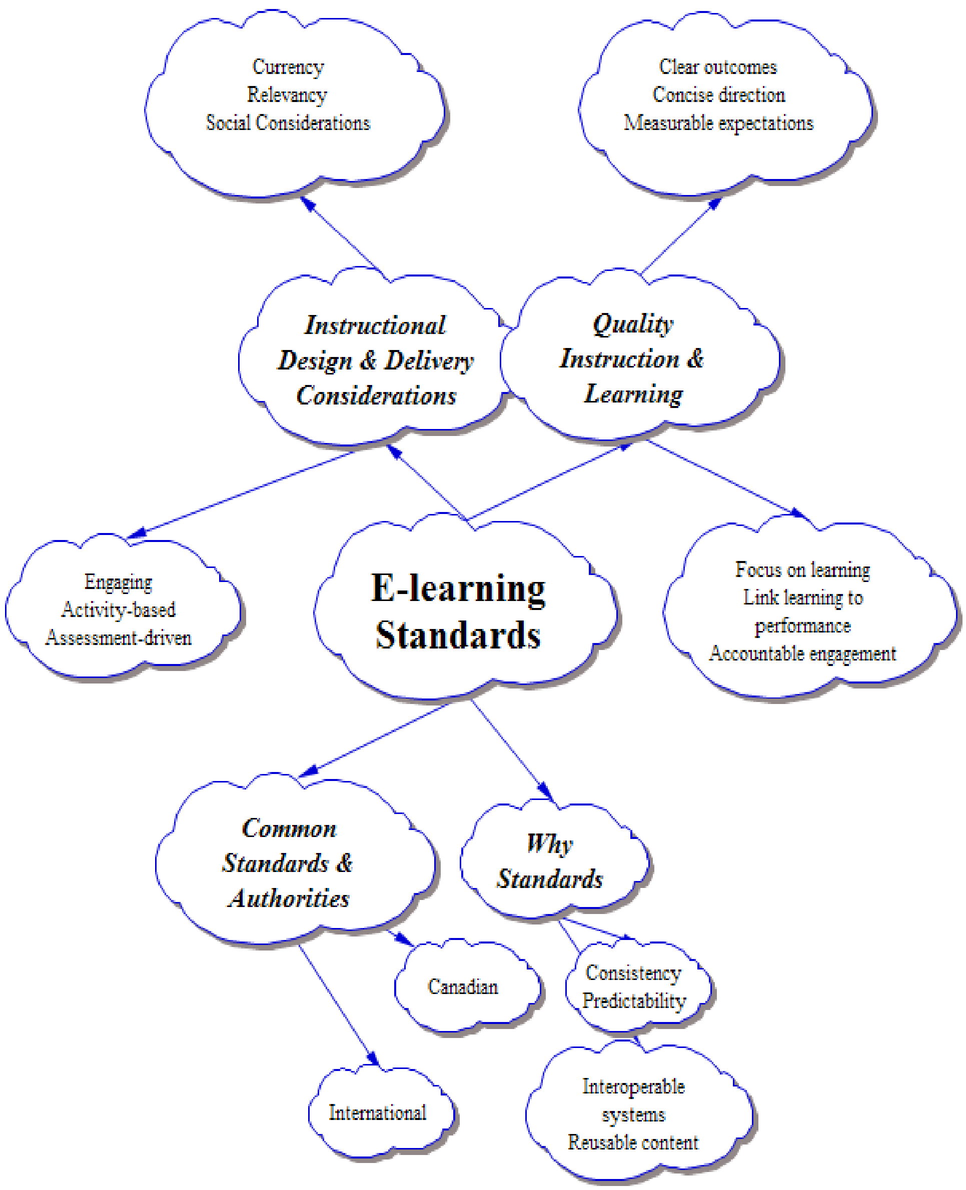
References

Much of the material used in this chapter comes from the websites of the organizations responsible for the different licences and initiatives where readers will easily find it. The Creative Commons website, in particular, has a helpful index of academic commentary. The following may also be helpful:

- Lawrence Liang *Guide to Open Content Licenses* version 1.2 2004 Piet Zwart Institute Willem de Kooning Academy Hogeschool Rotterdam. Available at http://pzwart.wdka.hro.nl/mdr/pubsfolder/opencontentpdf.
- Andrew M. St. Laurent *Understanding Open Source and Free Software Licensing*, 2004 O'Reilly. Reviewed by **Mike Fraser** in issue 42, January 2005 *Ariadne*.

17
E-learning Standards

Randy LaBonte



Learning outcomes

After completing this chapter, you should be able to:

- Identify the most prominent e-learning standards, bodies and organizations.
- Determine e-learning standards that could apply to your own e-learning situation.
- Apply standards in your organization.
- Look for more detailed information about standards for e-learning.

Introduction

Standards exist for many things, from safety standards in home construction and manufactured goods to standards of professional practice. Implementing e-learning requires that you adopt standards and specifications for both the development and delivery of content. Standards allow e-learning content, technological infrastructures, educational technologies and learning systems to be interoperable.

Because the gauge of railroad track was standardized, locomotives led the way for the industrial economy. Similarly, the Internet was born from the standardization of **TCP/IP**, **HTTP**, and **HTML** protocols for the World Wide Web. Historically, standards emerge when proprietary technology does not integrate with other technologies. Users of the technology demand changes that allow new products to work with existing ones (for example, the Blue Ray—High Definition DVD battle recently). This convergence provides the basis for a set of standards that ensures the consumer of longevity and consistency.

For the purposes of this chapter, the term standard refers to document descriptions containing technical specifications and criteria to be used as rules and guidelines to ensure content materials, delivery processes, and services meet their intended purpose.

Establishing e-learning standards began as part of a shift away from local, site-only content or programs to web-accessible ones. The migration away from proprietary systems and methods to common, shared ones, built the foundation for the development of standards. Today those standards form the basis on which e-learning can continue to develop and evolve. The standards enable the exchange of **learning objects** (content) and the technical integration of content, learning systems, and delivery platforms.

Instructional design and delivery considerations

Selecting content for use in any learning program, whether online or face-to-face, is complex, and varies according to learning environment, instructional approach, learner's needs and learning style, not to mention user and institutional preference. Section 1 discusses some of the more common issues and approaches in **instructional design**. General considerations include how content is presented to the learner, how interactivity is created, how learning is measured, and how social context is reflected. The following points are particularly relevant to an e-learning program, although they can be applied to any learning program. The list is not intended to be comprehensive, rather is included here to stimulate reflection on key elements for a learning program.

CONTENT/FORMAT

Learning materials should:

- Be relevant to the philosophy, goals, and learning outcomes of the curriculum.
- Make use of a variety of media presentation modes.
- Be accurate, current, and where appropriate reflect a diversity of learning approaches.
- Be suitable for online environments and accessible from commonly used hardware and software.
- Be designed for ease of use, simplicity of layout, durability, and accessibility.

INSTRUCTIONAL DESIGN

Learning materials should:

- Favour activity over text or lecture.
- Support group and individual learning.
- Promote an applied approach to learning.
- Activate the learner's prior knowledge.
- Encourage learners to develop critical-thinking skills.
- Offer choice and flexibility as appropriate to meet individual learning styles and interests.
- Promote attention and engage the learner.
- Provide adequate instructor direction and support.

EVALUATION/ASSESSMENT

Learning materials should:

- Provide continuous feedback to the learner
- Use formative and summative evaluation as appropriate.

- Track achievements for both the learner and instructor.

SOCIAL CONSIDERATIONS

Learning materials should:

- Reflect sensitivity to culture, gender and sexual orientation.
- Promote equality.
- Reflect sensitivity to the diversity of ethnic backgrounds, configurations, and values.
- Portray positive role models.
- Use language appropriate to the intended audience.

Quality first

Responsibility for e-learning often falls under an organization's human resources department or education authority, and typically personnel in these departments are responsible for, and most comfortable with, traditional classroom-based learning approaches. An e-learning environment's characteristics are different from those of a face-to-face classroom. Online instructors typically do not have visual feedback about learner engagement and must devise new strategies to encourage and measure learner engagement and achievement. Traditional classroom strategies do not necessarily transfer into an e-learning environment.

Whether online or onsite, good instruction is driven by a focus on quality to ensure continuous improvement and organizational performance. Standards for quality in academic settings typically centre on goals for achievement in numeracy, literacy, and critical thinking. In corporate training, standards describe goal achievement of specific skills and knowledge. In both settings, the drive for quality provides a framework for improving retention and raising achievement. Standards for quality learning set reasonable targets and expectations for instructors and students. Quality standards do not prescribe how instruction should be delivered, or how learning should occur. Rather, they set clear, concise, and measurable expectations that assist in selecting instructional strategies, assessment methods, and learning materials that support improved learning and achievement.

The drive for quality in e-learning is highlighted by the development of quality measures described by several organizations. For example, the British Learning Association's (BLA) (http://www.british-learning.com/qualitymark/index.htm) and QualitE-Learning Assurance's eQCheck (http://www.eqcheck.com/eq/home.html) both set quality measures and approve e-learning content meeting them. The BLA's "Quality Mark" is designed to improve the impact of learning interventions on performance across multiple sectors by setting quality indicators for all aspects of learning materials production and delivery. The focus of the eQCheck is quality assurance through assessment and evaluation of e-learning products and services for both consumers and providers. The BLA and eQcheck quality marks are used to give confidence to providers and consumers much like a vintners' "VQA" (vintners' quality assurance) mark does for the selection of wine.

A quality-driven approach invites debate about what constitutes effective learning, no matter the learning environment, instructional approach, or technological sophistication. However, a quality-driven approach can ensure:

- focus on learning, rather than instructional delivery;
- learning solutions that meet both organizational and learner needs;
- learning policies consistent with organizational objectives;
- a relationship between learning and organizational benefits;
- a process for establishing continuous quality improvement;
- a recognized institutional commitment to quality.

Why standards for e-learning?

> "The nicest thing about standards is that there are so many of them to choose from". – Andres S. Tannenbaum (ThinkExist.com, 2007a)

Standards clarify roles and responsibilities for instructors, learners, and others responsible for the outcomes of the learning. Standards also provide a framework to assist in the selection of a course or program. For governments, educational institutions and corporate authorities, standards inform policy and the allocation of resources or funding. The development of standards reduces risk for organizations making investments in technologies and e-learning content. Standards compliance assures data systems will be able to work together and that investment in intellectual capital is not lost.

At a minimum e-learning standards should ensure content is interoperable on any learning system. Standards should make life simpler by building consistency and predictability. Some would argue that in the world of e-learning the opposite is true, as the drive for standards has increased complexity and created more confusion. There are standards and specifications for learning objects, metadata, learning architecture, and instructional design, which most end-users find far too technical for their needs. What e-learning standards do have in common is the intention to assist both the development and delivery of online learning that, in the end, supports the end-user's learning needs and the organization's requirement to account for that learning.

Standards seem to come in two flavours: complex technical standards and specifications that define everything from minute details for multiple contingencies, to more user-driven general standards that enable content to be adapted for local consumption and use. Standards should fit within current practice and support learning—not promote a particular technical point of view or approach. Adoption of SCORM (shareable courseware object reference model) as a standard for online courses could be counterproductive for some organizations as it may conflict with instructional delivery methodology and approaches, whereas adoption of a subset of SCORM might prove more appropriate. For example, an institution or corporation may have invested in an HR database or learning system that does not meet all of the SCORM specifications for managing online content. Does this mean that new systems are required? To make matters more complex, SCORM is constantly undergoing update. So which level of SCORM compliance should be the standard? Should the standard of accessibility for all be required? If so, the adoption of this standard could limit the use of engaging media that would enhance learning for the majority of online learners.

Tip
The development of accredited standards reduces risk for organizations making investments in e-learning technologies and content. At a minimum the adoption of a set of standards should ensure that data systems work together and that investment in time and intellectual capital in existing content is not lost. The standards any organization adopts should ensure that content is interoperable on any learning system, enabling its reuse and re-purposing.

No matter the motivation, the reasons for adopting standards must be made clear to all, or the risk is to sign up to someone else's agenda. Standards that reflect current and emerging practice encourage development of engaging online learning. Standards that limit or constrain creative use of technologies and media can stifle effective e-learning. The best advice is to focus on learning, involve those responsible for development and delivery of content, and engage instructors and learners in the process. (See Chapters 10 to 13.) With the establishment of a clear set of goals and outcomes for developing an e-learning program, selecting content and technology while applying standards becomes a less daunting task.

Example from the field
In British Columbia standards for e-learning were developed in the context of existing practice and through the direct involvement of online practitioners (see the BC Ministry of Education's "Standards for K–12 Distributed Learning in British Columbia" available at http://www.bced.gov.bc.ca/dist_learning/documents/dl_standards.pdf). Standards from existing bodies were adopted and adapted to reflect existing, sound practice as well as to create a standards document that supported and guided the evolution of improved practice in the K–12 system for BC.

Common standards for e-learning

> "Standards are always out of date. That's what makes them standards". – Alan Bennett (Corliss, 2004)

While standards will vary from organization to organization, generally they address core aspects of e-learning including data specification, format, security, and exchange between systems, as well as content structure, cataloguing, and retrieval. Other standards attempt to address accessibility, engagement with the learner, instructional design, etc.

The key to understanding standards is to determine which apply to your instructional practice and support learning. The point of having a standard is to support and enhance practice, not to limit it. This is best captured by a policy of the International Open Forum. (2004, p. 3) which states:

> Standardization is one of the essential building blocks of the Information Society … The development and use of open, interoperable, non-discriminatory and demand-driven standards that take into account needs of users and consumers is a basic element for the development and greater diffusion of ICTs and more affordable access to them, particularly in developing countries. International standards aim to create an environment

where consumers can access services worldwide regardless of underlying technology.

Standards have been applied to the architecture of learning management systems (LMS) and learning content management systems (LCMS), as well as the development and metadata tagging of learning objects for presentation on these systems. Learning architecture standards set specifications for exchanging data with other learning systems and database programs (library resources, demographic or records information systems), and providing an environment to locate, manage, and deliver learning objects. Learning object standards set specifications for metadata tagging (how to make information about the learning object such as name, publisher, learning objectives, description of the content, visible), and how to integrate with a learning system (track learning, set mastery level, assess, and report on the learning that occurs using the learning objects).

The benefits of learning architecture and learning object standards and specifications to date have been:

- the ability to use learning objects from any compliant publisher or developer on multiple technological delivery platforms;
- data interoperability among different learning systems and database platforms; and
- the ability to use and manage learning objects as resources.

Common standards for e-learning include:

(1) Data specification
  - What data must be available for exchange with another system (items such as learner information, learner demographics, learning assignments, performance).
  - What each data item is to be called and what format it should be in (text, integer, decimal number, etc.).

(2) Data format
  - How data is packaged for exchange (comma-separated data, spreadsheet data, XML).
  - XML (a structured text format where every piece of data is preceded by its name) is the format most widely used.

(3) Message packaging
  - Details the protocol for sending the data from one system to another. (HTTP has become the standard).
  - Transaction management
  - Details the protocol for what the receiving system is to do with the data (such as creating a new learner, updating a learner record, creating a new performance record).

(4) Security management
  - Details how data is to be secured, and how to authenticate the sender of the data to make sure the sender has rights to send data and perform the transaction indicated.

(5) Content container specification
  - Details the environment that the learning management system will provide for the content it launches. (The least complicated and least capable container is a new browser window. More capable containers are browser windows that get data such as user identification information from the learning management system, bookmarks and sends data such as score and performance data).

(6) Cataloguing and metadata creation
  - Refers to the process of creating structured descriptions that provide information about any aspect of a digital resource (the information may include technical information about the digital entity or describe the process of digitization).
  - Types of specific process metadata may be administrative metadata, technical metadata and preservation metadata.

Standards regulatory bodies

"Standards are industry's way of codifying obsolescence". – Anonymous

Technology changes rapidly. Accordingly, the development of standards for e-learning is like a moving target. Many institutions and organizations first laid claim to "the standard" for online content and delivery. Several organizations have gained prominence in developing e-learning standards including:

- Aviation Industry CBT Committee (AICC)
- Sharable Courseware Object Reference Model (SCORM)
- IMS Global Learning Consortium (IMS)
- Institute of Electrical and Electronic Engineers Learning Technology Standards Committee (IEEE—LTSC)
- Canadian Core Learning Resource Metadata Application Profile (CanCore).

While compliance to standards and membership in any organization is voluntary, most major content developers and technology providers conform to some or all of the standards recommended by these organizations. In many cases regulatory bodies reference a set or sub-set of each other's standards. Others list only specifications and guidelines rather than standards, as the development and/or adoption of what will become a standard will continue. The following provides a brief background on each organization. The References section at the end of the chapter lists additional organizations and websites that may be of interest.

AVIATION INDUSTRY CBT COMMITTEE (AICC)

The Aviation Industry CBT Committee (AICC) is an international association of technology-based training professionals. The AICC develops guidelines for the aviation industry in the development, delivery, and evaluation of CBT and related training technologies. The AICC has developed methods that allow learning management systems to exchange information and track the results of contents.

Although AICC primarily attends to the aviation industry, their focus has led to very well developed specifications for learning, and particularly for computer-managed instruction. As a result, a wide range of learning consortiums and accredited standards groups adapt the AICC guidelines to their suit their own industries. The main link for the AICC is http://www.aicc.org/index.html.

SHAREABLE COURSEWARE OBJECT REFERENCE MODEL (SCORM)

The Department of Defense and the White House Office of Science and Technology Policy launched the Advanced Distributed Learning (ADL) initiative in 1997 to develop an open architecture for online learning. Its purpose was to support access to quality education and training resources tailored to individual learner needs and available as required.

The ADL Shareable Courseware Object Reference Model (SCORM) specification provides a common technical framework for computer and web-based learning that attempts to foster the creation of reusable learning content as "instructional objects". SCORM is based on AICC and the IMS Global Learning Consortium specifications. The ADL provides interoperability testing laboratories and intends to establish a certification program. The main website for SCORM is: http://www.adlnet.org/.

IMS GLOBAL LEARNING CONSORTIUM

The IMS Global Learning Consortium represents a number of large and small educational institutions, training organizations, government and software vendors interested in incorporating learning resource metadata into their software products. IMS is developing and promoting open specifications for facilitating online distributed learning activities such as locating and using educational content, tracking learner progress, reporting learner performance, and exchanging learner records between administrative systems. The IMS Project is funded solely by membership (the highest level of participation is the contributing member, with an annual fee of $50,000). The main link for IMS is http://www.imsproject.org/.

INSTITUTE OF ELECTRICAL AND ELECTRONIC ENGINEERS LEARNING TECHNOLOGY STANDARDS COMMITTEE (IEEE—LTSC)

The Learning Technology Standards Committee (LTSC), part of IEEE, is a formal standards body that produces standards with legal standing. The formal standardization process is generally based on existing process; in the case of the LTSC, the other organizations listed here provide input. The LTSC itself comprises several working groups that are developing technical standards, recommended practices, and guidelines for software components, tools, and technologies. They also design methods that facilitate the development, deployment, maintenance, and interoperation of computer implementations of education and training components and systems. The URL for the LTSC is http://ieeeltsc.org/.

CANADIAN CORE LEARNING RESOURCE METADATA APPLICATION RESOURCE (CANCORE)

CanCore interprets and simplifies the IMS metadata specification, which is a subset of the SCORM specifications. SCORM has been developed in the context of military and training applications, whereas CanCore's authors and audience have been the public and educators. CanCore enhances the ability of educators, researchers, and students in Canada and around the world to search and locate material from online collections of educational resources. CanCore is based on, and fully compatible with, the IEEE Learning Object Metadata standard and the IMS Learning Resource Meta-data specification. However, the IMS and IEEE are global consortia of educational, industry, and government bodies and the standards they produce are cumbersome and complicated. (Some standards require support of a set of metadata with more than 80 single elements). CanCore was developed to identify a minimum baseline of elements that end-users and institutions could agree were essential, simplifying complexity and providing guidance on general details related to the use of content..

Successful implementation of e-learning requires consistent interpretation of a standard's purpose and CanCore was devised to realize economies of scale in this process. Since its inception, CanCore has:

- conducted research into the field of learning object metadata;
- devised a workable, consensual sub-set of the IMS learning Object Meta-data Information Model, known as the CanCore Element Set (http://www.cancore.ca/guidelines/drd/);
- become a participant in IMS through the sponsorship of Industry Canada;
- developed informal ties with Dublin Core;
- written and presented numerous papers in the field of learning object metadata;
- created an XML-record bank showcasing sample CanCore records; and
- written the CanCore Learning Resource Metadata Profile Guidelines.

The key documents on which the CanCore Guidelines were based are:

- IMS Learning Resource Metadata Information Model (http://www.imsproject.org/metadata/imsmdv1p2p1/imsmd_infov1p2p1.html);
- IMS Learning Resource Metadata Binding Specification (http://www.imsproject.org/metadata/imsmdv1p2p1/imsmd_bindv1p2p1.html);
- IMS Learning Resource Metadata Best Practices and Implementation Guide (http://www.imsproject.org/metadata/imsmdv1p2p1/imsmd_bestv1p2p1.html).
- The IMS Learning Resource Information Model is itself based on the IEEE LOM.

The guidelines were also developed with consideration of the Dublin Core Initiative (http://www.dublincore.org/), particularly its element descriptions (http://www.dublincore.org/documents/dces/), qualifier descriptions (http://www.dublincore.org/documents/dcmes-qualifiers/), and usage guide (http://www.dublincore.org/documents/usageguide/).

E-LEARNING STANDARDS ADVISORY COUNCIL OF CANADA

The E-learning Standards Advisory Council of Canada enables different provinces to work together to identify common requirements of their respective educational systems and to communicate requirements to those who develop standards. As there are multiple standards in development, eLSACC was intended to ensure standards being developed meet Canadian needs. eLSAAC was initially supported by the Minister of Education of Quebec and Council of Ministers of Education of Canada. Five provinces, including British Columbia, have agreed to fund eLSAAC for a five-year period. The eLSAAC can be found at http://elsacc.ca.

Summary

> "Consistency is the last refuge of the unimaginative". – Oscar Wilde (ThinkExist.com, 2007b)

Standards anchor practice. If you are in the process of building an online program amidst shifting sands they can be the foundation you need. Consistency in and of itself is dull and predictable—and that may accurately describe some of the education and training programs available in classrooms and online—but contrary to Mr. Wilde from consistency creativity can be fostered. Standards do not need to be anchors that hold; rather they can be the base for consistency, predictability, and from which to build new and creative learning approaches. Understanding standards is one thing; applying them is another. The question remains, which standards apply, and how can you use them to build, not stifle, engaging learning?

Until recently standards conflicted with each other, with debate about which protocol, or set of protocols, should become a standard for development and/or delivery of content and which governing body should set those standards. The IMS Global Learning Consortium is emerging as a superset of all of the differing standards, and SCORM, based on the AICC and the IMS specifications, is emerging as the leading standard for e-learning content. However, SCORM compliance is a moving target, as specifications are set for multiple contingencies and circumstances. A far more practical subset of the complex SCORM standards and specifications are the CanCore regulations, which are intended to simplify and provide a minimum baseline for end-users and institutions to reference.

Finally, for the end-user and educator, simple and general standards statements are often used to both reflect and guide practice. For example, the Masie Center (www.masie.com) has described seven simple standards by which to support the development and sustainability of e-learning investment. Masie standards for e-learning are:

- interoperability of content between multiple systems,
- re-usability of content and code,
- manageability of content and systems,
- accessibility of content materials to learners,
- durability of investment,
- scalability of learning,
- affordability.

Tip
The Masie Center core standards can be used as founding principles for any e-learning program. The CanCore guidelines, based on the IMS and IEEE LOM standards and specifications (http://www.cancore.ca/guidelines/drd/), can be used to situate your selection of standards within the context of your overall goals and outcomes for your program.

Glossary

DVD. Short for "Digital Versatile Disc" or "Digital Video Disc", DVD is an optical disc storage media format used for data storage, including movies with high video and sound quality.

HTTP. Short for Hypertext Transfer Protocol, HTTP is a communications protocol used to transfer or convey information on the World Wide Web.

HTML. Short for Hypertext Markup Language, HTML is the predominant markup language for the creation of web pages, describing structure of text and how it is displayed on the World Wide Web.

Instructional design. Systematic method of planning, developing, evaluating and managing instruction to ensure competent performance by the learner.

Learning architecture. The technical structure of a learning system that enables the exchange of data with other data systems (interoperability).

Learning object. Any learning content such as an activity, resource or assessment item. In e-learning it is generally, but not always, an electronic or digital object such as URL, CD ROM, electronic file or software program.

Metadata. A set of words or phrases that summarizes the 'who, what, where, when and why' of a learning object (content). Metadata keywords label the ideas that are implicit in the learning object, much like a library classification system. Metadata information is not visible to a person looking at the learning object, but is to an LMS or LCMS.

Standard. Document descriptions containing technical specifications and criteria to be used as rules and guidelines to ensure that content materials, delivery processes, and services meet the purpose for which they were intended.

TCP/IP. The Internet protocol set of communications protocols that the Internet and many commercial networks run on, composed of the Transmission Control Protocol (TCP) and the Internet Protocol (IP), the first two networking protocols defined.

Resources

The following resource sites were not included in the chapter, and may be of use for further interest to the reader:

- **Centre for Educational Technology Interoperability Standards**—UK higher-education technology standards initiative http://www.cetis.ac.uk/.
- **International Open Forum**—Standards in e-learning: Towards enriching and sharing our educational heritage: Summary background & discussion paper. http://www.educational-heritage.uqam.ca/normes2004/WSIS-Paper-Final-E.pdf.
- **Merlot**—MERLOT is a free and open resource designed primarily for faculty and learners in higher education with links to online learning materials with annotations such as peer reviews and assignments http://www.merlot.org/.
- **National Institute of Standards and Technology**—A non-regulatory federal agency within the US Commerce Department's Technology Administration whose mission is to promote US innovation and industrial competitiveness by advancing measurement science, standards, and technology http://www.nist.gov/.
- **The eLearning Guild**—A community of practice for e-learning design, development, and management professionals—a member driven community for high-quality learning opportunities, networking services, resources, and publications http://www.elearningguild.com/.
- **www.StandardsLearn.org**—An online resource to raise awareness of standards and conformity of assessment programs by highlighting participation in the national and international standards development process http://www.standardslearn.org/.

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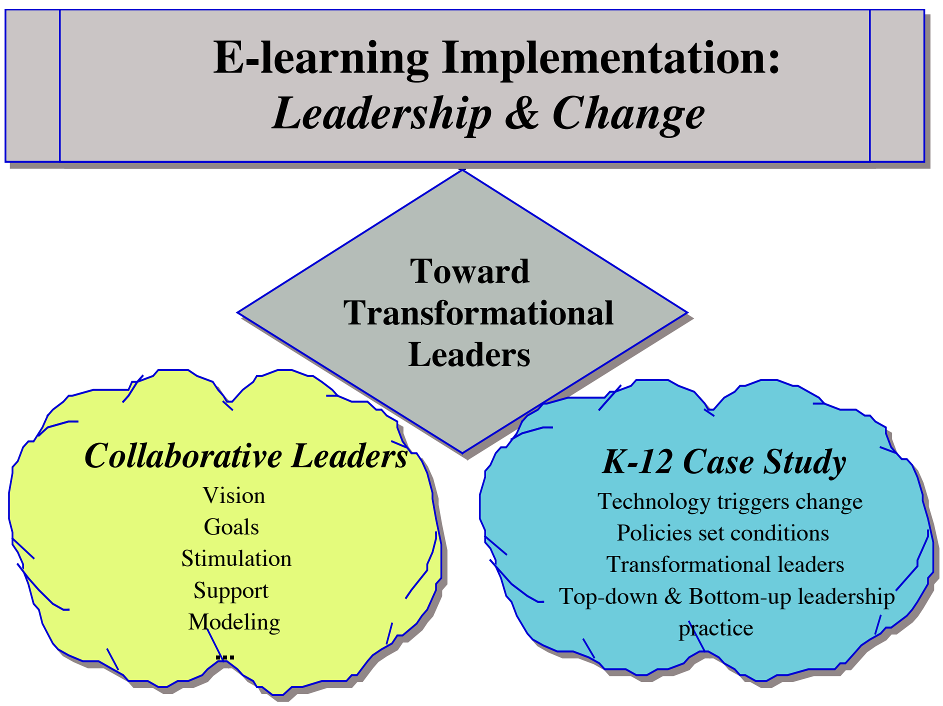
18
Leadership and E-learning: Change Processes for Implementing Educational Technologies

Randy LaBonte



Learning outcomes

After completing this chapter, you should be able to:

- Describe approaches for leading change and the development and implementation of educational technologies in your organization.
- Identify key leadership attributes and processes that support change management.
- Describe the critical processes that support and manage change for the implementation of e-learning programs.

Introduction

From cell phone, text, and instant messaging to podcasting, wikis, and blogs, the ability to connect and communicate with anyone in the world at any time is at our fingertips. When it comes to learning, technology is changing traditional notions about how instruction is delivered, and how learning is organized. Educational technologies are being used to create and present digital media, simulations, and environments that enhance, and in many cases replace, traditional textbooks, chalkboards, worksheets, and classrooms. Computers and the Internet connect instructors and learners in remote locations, and computer-mediated learning materials enable users to engage in learning when they choose,, rather than according to a classroom schedule. This use of educational technologies to support teaching and learning can be described as e-learning, and it is transforming the business of education and training.

It is one thing to have innovative technology, and preach about its ability to transform and revolutionize learning;. it is another to actually make this happen within traditional, structured education and training environments. Sound leadership and change management skills are key to implementing the use of new educational technologies to support e-learning programs and foster transformation. While leadership, reform and change management have been well studied and documented, little has been written about the role leaders play in the success or failure of e-learning program design, development, and implementation. Traditional theoretical and practical constructs do not adequately reflect emerging e-learning environments, yet **transformational leadership** theory provides insight into fundamental assumptions about change, control, order, organizations, people, and leadership in implementing e-learning programs. Promising research affirms the critical role of leadership in systemic change for e-learning design, development, and delivery, and confirms that without a clear vision combined with collaborative leadership, organizations could end up committing precious resources to the development and deployment of courses for e-learning without much success.

Why technology?

> If technology is the answer, what is the question? The paradox of technology-enhanced education is that technology changes very rapidly and human beings very slowly. It would seem to make sense for proponents of e-learning to begin with the learners. (Bates & Poole, 2003, p. xiii)

Many institutions and organizations are embracing technology in an effort to support the transformation of how, when, and where instruction is provided, and how learning is organized within a digital environment. Educational technologies connect learners and instructors in different geographic locations, transforming the learning environment and traditional notions about instructor-led education and training. In e-learning programs learners now choose when to engage in the lesson, and from what location—home, school, work, or abroad. Digital technologies deliver lessons to learners, replacing the traditional instructor in front of a classroom. E-learning programs are used to provide self-paced, online environments that change learning from delivery of information to facilitated coaching, mentoring, and peer learning. Learning is being transformed from the "sage on the stage" model to a learner centred "guide on the side" model.

Research on the use of educational technologies indicates they can be a powerful means of transforming teaching and learning, particularly in how both are organized (Crichton & Kinsel, 2000; Dexter, Anderson & Becker, 1999) and the use of new technologies has the potential to affect teaching and learning positively (Bennett, McMillan-Culp, Honey, Tally & Spielvogel, 2000). However, the integration and use of technologies in today's complex organizational environments demand significant change, and the literature is clear about the central role of leadership (Fullan, 1993, 2001, 2003; Leithwood & Duke, 1999; Sergiovanni, 1994, 2001; Creighton, 2003). While leadership and the management of change have been well studied and documented, little has been written about the role leaders play in the success or failure of adopting educational technologies and implementing e-learning programs.

Transformational leadership theory, first described by Burns (1978) and Bass (1985), and later elaborated on by Leithwood and colleagues (Leithwood & Riel, 2003; Leithwood & Jantzi, 2005; Silins & Mulford, 2002), lends itself to describing and understanding the processes involved in the implementation of educational technologies in e-learning environments. Leadership is a central factor in the successful use of education technologies (Creighton, 2003; Coleman, 2003; Davidson, 2003; Foster & St. Hilaire, 2003; Hughes & Zachariah, 2001; National Center for Education Statistics, 2000). Transformational leadership in this context is about deploying technologies to accomplish core organizational goals in attaining a shared vision compelling enough to transform practice. Stated another way, implementing educational technologies requires us to resolve significant instructional, pedagogical, and technological issues, all of which need to be balanced against the purposes of learning. This kind of change management requires leadership. Transformational leadership theory can offer insight into fundamental assumptions about change, control, order, organizations, and people, and provide a more useful base from which to examine leadership and e-learning program adoption.

What is leadership?

> The essence of leadership is to be found in relationships between motives, resources, leaders, and followers. (Leithwood & Duke, 1999, p. 49)

Leadership is generally defined as the ability to influence and persuade others to agree on purpose (Gardner, 1990; Bennis & Nanus, 1985; Bolman & Deal, 1995; Sergiovanni, 2001). Early descriptions of leadership focused on personal qualities of a leader, the "great man" approach. These traditional views of leadership emphasized a leader's charisma and personal conviction, however fell short intellectually, as they served only to describe leaders as displaying leadership, no more compelling than arguing that athletes display athleticism. A list of personal characteristics was not sufficient to adequately describe leadership as a practice. Situational leadership began to capture the notion of leadership in context, but still emphasized managerial and operational functions. However in the past two decades literature has emphasized data-driven results focusing on the behaviours of leaders as they engage in activities affecting growth and learning (Leithwood & Duke, 1999). Recent models of leadership focus on relationships within **community** (Sergiovanni, 2001) and the ability of the leader to cope with complex change (Fullan, 2003) and **organizational learning** (Leithwood & Riehl, 2003; Mulford, Silins & Leithwood, 2004; Silins & Mulford, 2002).

If leadership is the art of getting things done with others, then it is also a shift from a "paradigm based on power and control to one based on the ability to empower others" (Silins & Mulford, 2002, p. 5), and this empowerment occurs within a learning community. Gardner (1990) emphasizes that "skill in the building and rebuilding of community is not just another of the innumerable requirements of contemporary leadership, [it] is one of the highest and most essential skills a leader can command" (p. 118). Sergiovanni (2001) describes leadership as both cognitive and moral—having more to do with values and purpose than bureaucratic need, less about position, personality and mandate and more about ideas. According to Bennis (1989, 1999), leadership is for the benefit of followers, not the enrichment of leaders, and is the capacity to translate vision into reality.

Leadership is "the process of persuasion or example by which an individual (or leadership team) induces a group to pursue objectives held by the leader or shared by the leader and his or her followers" (Gardner (1990, p. 1), or, as Leithwood (2003) puts it:

> At the core of most definitions of leadership are two functions: providing direction and exercising influence. Thus, it may be said that leaders mobilize and work with others to articulate and achieve shared intentions (p. 7).

Leaders, then, pursue agreed purposes, shared vision, and serve others in achieving those purposes (Sergiovanni, 2001; Shields, 2003; Leithwood & Jantzi, 2005), and this pursuit is done in community. Leadership involves social relations and ends, purpose, direction, and influence. It is contextual and contingent on the setting, and educational technologies have changed the landscape of those settings.

Leadership and change

> The differences between leaders and managers: those who master the context and those who surrender to it (Bennis, 1989, p. 44).

If leadership is about shared vision in action, then that action is about change. The speed and complexity of change is increasing rapidly. What was once considered a linear and straightforward event (implementing change) is now more open-ended and complex. It is not enough to *manage* change, it is now important to *lead* change: "change is a *requirement* [italics original] for continued success, and competent change leadership is a most coveted skill" (Anderson & Ackerman-Anderson, 2001, p. 1). Change involves working with others—not simply mandating new actions or behaviours. Lambert (2002) describes the notion of leadership as the professional work of everyone in the organization, with the development of shared leadership dependent on participation, vision, inquiry, collaboration, and reflection on success.

When change is considered in the context of educational technologies, the Consortium for School Networking (2004) found that the quality of leadership was a primary indicator of whether technology funding was spent wisely or wasted, and that without meaningful leadership backed by supportive communities of practice, disparities in technology budgets increased. If building the leadership capacity of an organization is key to influencing change and adopting new educational technologies, then success will depend on the ability to build a community of leadership and organizational learning (Leithwood, 2005) centred on e-learning. Leadership "influences … the way instructors organise and conduct their instruction" (Mulford, Silins & Leithwood, 2004, p. 9) and is driven by the alignment of values and vision, and ability to "reflect in, on, and about action in each context" (Silins & Mulford, 2002, p. 5). That context is the digital learning environment created through the use of educational technologies, a place where traditional constraints and assumptions about learning and delivery of instruction shift.

Research on change describes how successful change takes place within a supportive community of practice that embraces pedagogical review (Fullan, 2001 & 2003), and that leadership is a key factor in the successful use of educational technologies (Creighton, 2003; Coleman, 2003; Hughes & Zachariah, 2001). Stated another way, to adopt educational technologies and implement e-learning programs, significant pedagogical and technological issues need to be considered and balanced against the purpose of education and training. Papert (1998) argues that if we confine our views of change to that which we already know or are familiar with, we could deprive ourselves of a new future. In other words, if we keep doing what we already know, we will keep getting what we already have. As technology continues to support rapid change in how information is processed, stored, and disseminated, Papert contends that the future could take us by surprise. As long as leaders confine the use of educational technologies to simply improving what is, little of significance can occur. Cuban (1996) describes this dilemma clearly as it relates to the implementation of educational technologies:

> Techno-reformers, mostly public officials, corporate leaders, and other noneducators far removed from classrooms, deeply believe in the power of technology to transform schools into productive workplaces. This persistent dream of technology driving school and classroom changes has continually foundered in transforming teaching practices. (para. 2)

Leadership, technology, and pedagogy

> Technology is powerful, but only in the service of a powerful conception. (Fullan, 2003, p. 86)

Bracewell et al. (1998) conducted an extensive review of literature on educational technologies and found that successful e-learning programs combined technology with effective pedagogy and instruction. This integration was found to increase learner interest and motivation in learning, creating learner-centric environments, and increasing the number of learning opportunities. A meta-analysis of the research on educational technologies conducted by Ungerleider and Burns (2003) found that the effectiveness of technology use was correlated to the level of interactivity provided by the technology. Both sets of research reinforce the notion that successful learning is measured by the engagement of the learner. The creation of interactive learning through the use of educational technologies at a minimum requires an investment in review of instruction and learning. Research suggests that educational technologies can have a positive impact on teaching and learning, but only if leadership and vision bring focus to using technology to support core learning goals (Bennett et al, 2000). While technology is often viewed as pedagogically neutral, it can either enable or inhibit learning (Moll, 2001). The organization of learning and engagement of learners through educational technologies is essential to pedagogy (Bednar, Cunningham, Duffy & Perry, 1992; Gayol & Schied, 1997), and this organization of learning for an e-learning program is an essential part of the role that leaders influence.

While the introduction of educational technologies has the potential to transform learning (Crichton & Kinsel, 2000; Dexter, Anderson & Becker, 1999; Bennett et al., 2000), such transformation involves changing pedagogy and how learning is organized. Zhao (2002) found that educational technologies were effectively used in instruction when educators developed detailed plans for their integration and use. Creatding the conditions for successful implementation, t, including required hardware, and availability of Internet and network connections, are the domain of decision makers and leaders. Managing new educational technologies requires the ability to make choices and changes, particularly as the introduction of new educational technologies affects pedagogy, which in turn can influence the organization and structure of learning. Implementing e-learning programs is new ground for most leaders. Instructional design and delivery is different in an online environment, and traditional notions about how learning is organized do not necessarily apply.

Implementing an e-learning program, therefore, requires a review of pedagogy, instructional design, and delivery. Creighton (2003) believes that effective integration of educational technologies has more to do with pedagogy than it does technology. His views capture the essence of the issue of change, whether through adoption of educational technologies or not; any change involves pedagogy, and a fundamental examination of instructor-held beliefs about instruction. This type of change requires time and effort, and unfortunately, far too often innovation simply recreates or attempts to improve what is already taking place, with little change in pedagogy. Change demands meaningful and thoughtful leadership. While little has been written about how conventional leadership theories apply in new e-learning environments, emerging transformational leadership theory can be used to provide insights into how change processes can be understood and managed when implementing an e-learning program.

Transformational leadership

To cope with a changing world any entity must develop the capability of shifting and changing, of developing new skills and attitudes: in short the capability of learning (De Gues, 1997, p. 20).

Transformational leadership provides a useful and relevant perspective from which to examine change processes involved in adoption and use of educational technologies. Research into factors affecting technology use for teaching and learning by Byrom and Bingham (2001) found that leadership was a key ingredient in the adoption and use of educational technologies. Leadership practice started with vision, leading through example, included support for followers, and shared leadership that maintained focus through evaluation of the change implemented. The International Society for Technology in Education (2001), through its National Educational Technology Standards Project, found that the core curriculum and content area skills required for school technology leaders were leadership and vision; learning and teaching; productivity and professional practice; support, management and operations; assessment and evaluation; and social, legal and ethical issues.

These characteristics of leadership are clearly described in the literature on transformational leadership, hence its applicability to understanding change in the context of implementing educational technologies. Substantial research conducted by Burns (1978), Leithwood & Jantzi (2000, 2005) indicates that complex and dynamic change, such as the implementation of educational technologies, is more likely to occur through transformational leadership. Transformational leadership "can be thought of as a set of behaviors of individuals who accomplish change" (Valdez, 2004, para. 12), and "is about change, innovation, and entrepreneurship" (Tichy & Devanna, 1990, p. xii). Transformational leadership is dynamic. It is building motivation and purpose in followers where the greater good of the organization is placed ahead of personal interests. For Burns (2003), "a leader not only speaks to immediate wants, but elevates people by vesting in them a sense of possibility, a belief that changes can be made and that they can make them" (p. 239).

Bennis and Nanus (1985) describe transformational leaders as using knowledge and engendering trust to build commitment through communication to a shared vision to support change and transformation. Transformational leadership is the development of vision within a supportive culture, and the articulation of goals to achieve a collective vision (Silins & Mulford, 2002). Transformational leadership invokes change, and is more about innovativeness than innovation, less about strategy and more about strategizing. It is shared leadership, where everyone involved in the organization are leaders. This requires participation, vision, collaboration, and reflection—all of which require a sense of community and a direct link between leading and learning (Lambert, 2002). Leithwood and Duke (1999) describe seven dimensions of transformational leadership:

- creating a shared vision
- setting goals
- providing intellectual stimulation
- supplying individual support
- modelling effective practice
- meeting high expectations
- developing a positive culture, and creating structures that support active involvement in decision-making.

Developing shared vision and setting goals is a process that engages leaders and followers to achieve something greater than if left to their own self-interests. The process helps to create new structures to support active involvement. Transformational leaders engage process, and then promote change by valuing individual difference and supporting followers. They model the practice they wish others to emulate, and keep true to the vision and goals. They instill feelings of confidence, admiration and commitment in followers. Each follower is coached, advised, and delegated some authority within the organization. The transformational leader stimulates followers intellectually, arousing them to develop new ways to think about problems, and in the case of e-learning, new ways to think about the organization of learning and delivery of instruction.

Leithwood and Jantzi (2005) shaped a set of transformational leadership behaviours (TLBs) derived from their meta-analysis of the literature in school settings (see Table 18.1, Transformational Leadership Behaviours for details). Three of the groups of behaviours—setting directions, helping people, and redesigning the organization—are based on transformational leadership theory, while the last, an aggregate of transactional and managerial leadership, is based on Bass's (1985) transactional model and attempts to fill gaps in transformational leadership theory. In setting directions, transformational leaders identify and articulate a vision, foster acceptance of group goals, and ensure high performance expectations. The vision may be one that is developed in a community collectively, or one that the leader espouses and articulates to followers for their endorsement and engagement.

In helping people, transformational leaders motivate by modelling high expectations, or "idealized influence" as described by Bass (1985), and they encourage and support followers to do the same. Knowing your followers is key to this dimension. In the case of adoption of educational technologies, leaders embrace and use technology as part of their professional work, and encourage followers to do the same for their own professional needs as well as part of their professional practice with learners. Transformational leaders create formal structures for dialogue and discussion that build collaboration, and expand those structures to include opportunities to engage all constituents.

Transformational leadership, then, is a model that describes how to build capacity for change that can support implementation of an e-learning program. Previous models of leadership stressed centralized control within hierarchical organizational structures, leading to a "top down" approach. A decentralized model based on flatter organizational structures leads to a "bottom up" approach associated with a transformational model of leadership (see Bass, 1985, 1997; Silins & Mulford, 2002; Leithwood, 2005). For example, in a three year study of high schools in two Australia states, Silins & Mulford (2002) found that transformational leaders demonstrated active interest in teaching and learning, but more importantly they "help establish the systems and structures that support 'bottom up' approaches and allow 'top down' approaches to succeed [and] are effective because they are, above all, people-centred" (p. 31).

Table 18.1. Transformational Leadership Behaviours (TLBs) (Leithwood & Jantzi, 2005, p. 8)

Transformational aggregate
1. Setting Directions
1.1. Vision (Charisma inspirational motivation) [italics original]
1.2. Group goals
1.3. High Performance Expectations
2. Helping People
2.1. Individualized consideration/support
2.2. Intellectual stimulation
2.3. Modeling (idealized influence—attributed and behaviour)
3. Redesigning the Organization
3.1. Collaborative cultures
3.2. Structures to foster collaboration
3.3. Building productive relations with parents and the community
4. Transactional and Managerial Aggregate
4.1. Contingent reward
4.2. Management by expectation: active, passive
4.3. Management
Staffing
Instructional support
Monitoring school activity
Buffering

Transformational leaders focus on those involved in the change, their relationships, and seek to transform feelings, attitudes and beliefs in support of organizational direction, established through a clear, shared vision. In his meta-analysis of the research on transformational leadership, Leithwood (2005) concluded that "as an image of ideal practice, transformational leadership currently is challenged only by instructional leadership in both practitioner and scholarly communities" (p. 2). Leithwood cautions, however, that most research on transformational leadership in non-school contexts has been restricted to the work of

Bass (1985), while he and his colleagues have done the majority of the research in school contexts.

Theory is one thing, practice yet another. Transformational leadership theory is relatively new. While more research will substantiate its usefulness, particularly as it applies to adoption and use of educational technologies, it has limitations. While the literature describes how vision, goal orientation, and progress is communicated, it does not describe how that communication is received. Too often superficial dialogue is created when transformational leadership processes are used, and while communication occurs, understanding does not. Transformational leadership theory also claims to explore equality and justice issues, yet studies reflect organizational change, not issues of equity, social justice—the "digital divide" for any e-learning program. Further research into the effects on pedagogy of the adoption of educational technologies, particularly with a view to equity issues in e-learning programs, is worth consideration.

Case study: developing e-learning programs in K–12

A case study of K–12 educators in British Columbia conducted by the author as part of doctoral research (LaBonte, 2005) provides insight into how leaders in the BC e-learning community supported implementation of educational technologies. Educators in BC were attempting to create flexibility and innovation within the public education system through the use of educational technologies and were challenged to create conditions for adaptation and change. The study focused on identifying decision-makers and leaders in the BC e-learning community and describing characteristics of these leaders. These leaders were found to have a desire to learn, seek challenges, take risks, and to improve learning. BC e-learning leaders had a clear vision, were highly motivated and hard working, finding it difficult to say "no". They were focused on learning, exhibited clear and consistent communications, were passionate about what they did, and had a clear focus on strategic goals. These leaders within the evolving BC e-learning community exhibited characteristics attributed to transformational leaders.

E-learning programs flourished in British Columbia in part to accommodate Tapscott's (1998) "net generation," but more importantly because of policy changes initiated by the Ministry of Education under the stewardship of a new government. Change was precipitated from both 'top down' and 'bottom up' approaches. The Ministry of Education was spearheading a "choice" agenda, whereby parents and students would have different options for required schooling. Technology was seen as a key part of the choice agenda. In an effort to foster change and innovation, policy was changed to release a cap that restricted the number of distance learning (e-learning) programs in the province. Policy changes were made that reduced restrictions and created conditions that stimulated new ways of providing learning opportunities for learners. At the same time, despite a critical lack of resources to support these new and emerging learning approaches and structures, a shared vision, collective goals, and passionate belief in the ability of educational technology to support change held by these leaders was compelling enough to continue to drive the change and implementation of e-learning in BC K–12 schools.

A summary of core findings of the study determined four distinct insights:

- Leaders within the BC e-learning community believed educational technologies were a catalyst for changing how learning is organized and supported.
- Policy was a key influence in development of e-learning in the K–12 sector, and was found to precede change and reform.
- Features of transformational leadership were evident in leadership practice within the BC e-learning community at both provincial and school levels.
- There was a tension between top-down and bottom-up leadership approaches that could be attributed to a lack of resources provided to support program implementation.

The case study reaffirmed the key role leaders play in change, and confirmed that without a clear vision, collaborative leadership, and an adequately resourced system-wide approach, organizations could commit precious funding to e-learning without much success. In short, the study affirmed the importance of transformational leadership as a process to encourage change and implementation of new e-learning technologies while ensuring fiscal responsibility.

Summary

> What is exciting and encouraging [is that] with appropriate instructional leadership by principals, technology can be an effective catalyst for educational reform. (Creighton, 2003, p. 46)

The above quote from Creighton highlights the relation between leadership, technology and pedagogical change. The implementation of educational technologies can transform learning, but not without significant investment in reviewing how instruction is delivered and how learning is organized. Transformational leadership theory provides insight into how to manage the change processes required for this to happen.

Sound leadership and change management skills are central to implementing the use of new educational technologies to support e-learning programs and foster transformation. Traditional theoretical and practical constructs do not adequately reflect emerging e-learning environments, and transformational leadership behaviours can be used by those leading e-learning programs to guide and support change in their organizations. By providing individualized support and consideration, encouraging followers to aspire to organizational interests and move beyond self-interest, transformational leaders provide intellectual stimulation, and challenge followers to question the status quo. Through their actions, these leaders model expectations, challenge others to question, and inspire followers.

In the case of implementing e-learning programs, transformational leaders model the use of technology, create collaborative cultures, restructure conditions to provide time for planning and problem-solving for redesigning how learning is organized. Transformational leaders build productive relationships that foster creative uses of educational technologies to engage learners and support new learning environments that alter how learning is organized. Promising research affirms the critical role of leadership in e-learning design, development, and delivery, and confirms that without a clear vision combined with collaborative leadership, organizations could end up committing precious resources to the development and deployment of courses for e-learning without much success.

Glossary

Community. An organization's constituents and the environment within which these constituents interact.

E-learning. The use of educational technologies to support online learning. E-learning programs are generally delivered through educational technologies using computer-based, online, or web-enabled course material and instruction.

Educational technologies. Communication tools that support the process of teaching and learning—chalk and blackboard, video machine, computer hardware and software, and the Internet. Bates and Poole (2003) describe educational technologies as including "any means of communicating with learners other than through direct, face-to-face, or personal contact" (p. 5).

Leadership. The ability to influence others and provide direction for change in organizations.

Organizational learning. The process of improving actions through better knowledge and understanding.

Transformational leadership. A model of leadership that describes how to build capacity for, and support of, change.

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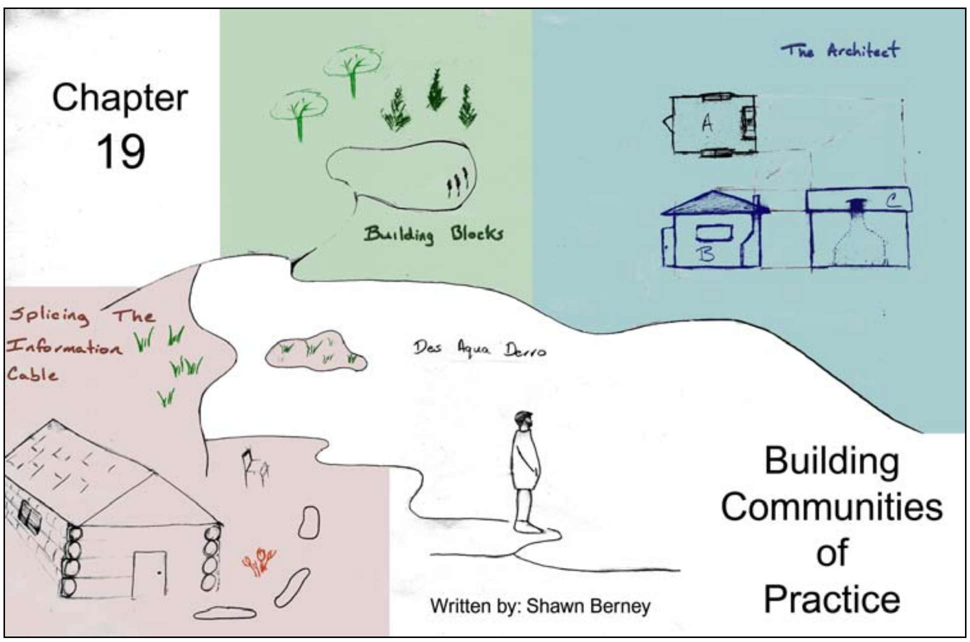
19
Building Communities of Practice

Shawn Berney

The reason that Linux hackers do something is that they find it to be very interesting, and they like to share this interesting thing with others. Suddenly, you get both entertainment from the fact that you are doing something interesting, and you also get the social part. This is how you have this fundamental Linux networking effect where you have a lot of hackers working together because they enjoy what they do.

Hackers believe that there is no higher stage of motivation than that. And *that* belief has a powerful effect on realms far beyond that of Linux. – Linus Torvalds, *The Hacker Ethic,* Prologue, p. xvii



Learning outcomes

After completing this chapter, you should be able to do the following:

- Discuss technology's effect on social practices within a community.
- Identify resources that rationalize the design theory for developing information and communication technologies (**ICTs**).
- Define and apply the following technical terms as they apply to computer interactions:
  - platforms
  - applications
  - services
- Explain the relevance of technical standardization to interpersonal communication tools such as email.
- Describe underlying processes (recording, referencing, and publishing data) that occur in mainstream commercial applications such as Microsoft Outlook®.
- Identify facilitation and sequencing techniques that may enhance digital community interactions.
- Describe how modelling tools can support community involvement in the development of digital community infrastructure.

Introduction: the turkey boat problem

The Power to Edit

Each spring an excited group of athletic individuals filter into the small and close-knit whitewater rafting community. Upon arriving at the river community these trainees are given a place to camp, and an opportunity to ride along with the senior guiding staff. Although the senior guides are tolerant of the new arrivals, they recognize that, in an average training year, only one third of them will eventually become guides.

Over several months, the new arrivals will be asked to practise rescue techniques, learn to read complex whitewater hydraulics and develop sound decision-making abilities within highly stressful and quickly changing conditions.

Only after these hard skills have been attained can trainees begin to comprehend the immense responsibility they hold for the safety of others. In an effort to manage the risks inherent in rafting, guides need to develop their problem-solving techniques before they progress into dangerous situations. Whitewater guides must understand that each participant plays an important role in an interdependent team, which must coordinate efforts in order to successfully navigate treacherous and complex whitewater rapids.

Often people who want to become a professional guide see the role of guiding as a burden to be shouldered through physical strength and expertise. Indeed, physical competence is an important component however, the importance of the other team members within the boat is often underestimated. This lack of recognition can quickly lead to failures in communication—creating an environment where accidents can occur.

The turkey boat is used in raft guide training to address the importance of teamwork and communication. A team of guide hopefuls (around eight, total) with little or no direct advice, are given a whitewater raft, paddles, life jackets and helmets and told to navigate difficult whitewater rapids.

Much like learning to drive a car, the kinetics of whitewater rafting are not overly complex. Your paddle works as the steering wheel, gas pedal and brake. And as with driving a car, once the basic kinetics have been learned, confidence quickly follows. Unlike a car, however, a raft can be controlled by any of the individuals holding a paddle—and to complicate matters, each individual is viewing the river from a different location. So the turkey boat consists of eight individuals, armed with minimal technical knowledge and growing (sometimes inflated) confidence, eagerly striving to prove their leadership ability.

Leadership development schools such as Outward Bound have taught basic sports psychology for years. The idea behind these schools is that group development progresses through stages. Further, these stages can be used to develop tools that facilitate highly dynamic group interactions. Although raft guiding activities can be classified as adventure recreation, or perhaps even educational, the focus of guide training programs are to build physical and social competencies, including guiding technique, communication, respect, and problem-solving. Because of this focus, guide training programs can be described as a developmental adventure education.

Developmental adventure education contains a strong process-based component. This process can be used to assess the goals of the group and attempt to facilitate a trajectory of learning for the participants. These trajectories work to place engagement in activities in the context of a valued future within the group. In this way, learning can be experienced as a form of identity.[20]

[20] A detailed review of this process can be seen in many written works, but most notably, the recent works of Etienne Wenger who has developed a persuasive and detailed analysis of this position.

The adaptation of personal behaviour is the foundation of developmental adventure education. Facilitating the process of adaptation guides the participant in developing an understanding of group expectations, norms and behaviours.[21]

Building blocks

The leadership concepts and lessons of the turkey boat also apply to community interactions.

In this section we look at theories of community development, balanced with an understanding of how digital communities, and technology generally, have pervaded daily lives.

Conceptual investigations

The emerging nature of cyberspace has caught the imagination of writers for decades. Prolific science fiction writers in the mid-1980s introduced what were then radical ideas about how the Internet would create a space for perfect regulation.[22] Today, this question of regulation has become more relevant then ever before. Increasingly society is using the Internet for commercial enterprise. As a result, control is coded by commercial interests, and backed by government legislation.[23] Yet resistance to this control is spreading throughout many digital communities that perceive themselves as being oppressed.[24]

For some founders of the digital era such as Linus Torvalds[25] ,the ability to communicate and share information has always been fundamental to both personal and professional development. These technological pioneers have attempted to provide the tools for individuals to contribute to a community. These contributions allow individuals to create, adapt and adopt the rules that govern the digital community's very social fabric—its code.

INFORMATION WITHIN CYBERSPACE

It is the ability for individuals to contribute to the community that provides the context for information to be applied to practices.[26] More generally stated, our participation within the digital world allows individuals to build relationships with others. These relationships form the foundation for our collective social interactions within the online space.

It is only recently that researchers have begun addressing the social consequences of new technologies.[27] Our optimistic perception that technology will radically transform our business processes have been somewhat tempered in recent years. Researchers are beginning to realize that "technology does not have any impact per se, it is all a matter of choices, power and situated change—the digital economy is not evolving by itself; it is all about choices at the societal, company and individual level" (Anderson, Fogelgren-Pedersen & Varshney, 2003, p. 211). The management of the technology that controls information is becoming increasingly important.[28]

This chapter assumes that the important choices regarding the very design of digital communication must be based on the values of the community using the technology. As technology continues to shape society's material structure,[29] individuals and organizations must

[21] This is reinforced by Fabrisio and Neill who state "adaptation is necessary for individuals to achieve a sense of belonging which… must be obtained before individuals can experience personal growth" (n.d., p. 5).

[22] William Gibson's influential book Neuromancer, released in 1984, is one example of the deep uncertainties many people felt when envisioning the future role technology would play within society. (Lessig, 1999, p. 5).

[23] The ability for commercial enterprises to influence government legislation for increased control can be seen within the recent Digital Millennium Copyright Act within the US.

[24] John Perry Barlow (1996) describes the perceptions and resentments of many within cyberspace through his persuasive essay entitled 'A Declaration of the Independence of Cyberspace'.

[25] Linus Torvalds was the developer who released the Linux operating system (OS)—a computer OS that competes with Microsoft Windows. This OS has the advantage of allowing the public to access and modify its fundamental operations through altering computer code.

[26] For a detailed review of how individuals contribute to practices in the development of a community see Etienne Wengers' book entitled "Communities of Practice" (1998).

[27] Of particular note is the new research group at the University of Surrey, UK—the Incubator for the Critical Inquiry into Technology and Ethnography (INCITE). Established in 2001, this group focuses on research at the intersection of qualitative sociology, design and new technology.

[28] A persuasive argument outlining how changing technological resources are affecting organizations can be found in the Journal of Information, Communication & Society entitled 'Mobile Organizing using Information Technology (MOBIT)' (Kim Viborg Andersen et al., 2003, pp. 211–228).

[29] This is an argument put forth by Manuel Castells as an epilogue to Pekka Himanen's book *The Hacker Ethic*

work to regulate30 these technological developments by supporting initiatives that represent the values of the community.

THE ROLE OF ICTS IN COMMUNITY PRACTICES

The need to support community practices[31] through information and communication technologies (ICTs) is not a new idea. The evolution of document retrieval systems—historically used to store publications, and searched through keyword indexes—has changed into something substantially more sophisticated.[32] A similar evolution has occurred in software applications once designed as contact databases that now offer fully featured customer relationship management (CRM) applications.[33] These similar forms of information and communication technologies (ICTs) have been met with mixed success. Horwitch and Armacost of Bain & Company suggest that the cause of this mixed success stems from poor deployment.[34]

Critics will point out that consulting companies have a vested interest in advancing high-tech solutions (Oshea & Madigan, 1997, p. 92). Furthermore, despite the fact that many clients will face similar issues, these consulting companies sell themselves on their ability to develop unique solutions (Oshea & Madigan, 1997, p. X). Given this information, it becomes reasonable to view the advice of consulting companies on this matter skeptically.

To address the tough questions on efficiency and effectiveness of ICTs, researchers are exploring how technological developments interact with communities and organizations from sociological and ethnographic perspectives (see Pinkett & O'Bryant 2003, Wakeford 2003, Wenger 2004a and Wenger 2004b). These researchers are working to address how to evaluate and develop ICTs that add value for the individuals within the community. Although each of the researchers approach the issue of value creation in different ways,[35] all situate the application of information at the individual as apposed to the organizational level. This is a fundamental shift in context from researchers such as Kaplan and Norton[36] (2004) who suggest that knowledge is a commodity that is made available to community members (rather then being created by them).

Perhaps one of the greatest difficulties in approaching the question of what role ICTs should play within community practices involves developing an understanding of different ways in which a community can be supported.[37] In this chapter we assume that the application of information to relevant situations results in the creation of knowledge. As this information influences others through their participation in the process of learning, the community develops a more or less unified view of

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(2001). My arguments have been greatly influenced by the book's proposition that a fundamental shift in the social perspective will be required to adapt to, and excel within, the newly forming information age.

[30] Regulation within this context is synonymous with 'constrain' and can include limitations imposed by market demands, social norms, legal consequences and architectural designs. This definition has been taken from Lawrence Lessig, a constitutional lawyer, who addresses the regulation of cyberspace in his 1999 book Code and Other Laws of Cyberspace.

[31] Community practices as described here has been defined by Etienne Wenger as "groups of people who share a passion for something that they know how to do, and who interact regularly in order to learn how to do it better" (Wenger, 2004, p. 2)

[32] Accenture Consulting (previously Anderson Consulting) has an article entitled "In Search of A New Generation of Knowledge Management Applications" (Liongosari, Dempski & Swaminathan, 1999). This article describes in detail how document retrieval systems can be enhanced to allow for greater efficiency in searching and evaluating information providing tools such as biography generators and rate of absorption statistics.

[33] Interface Software offers a fully featured CRM application designed to incorporate customer list management with client management and relationship analysis (http://www.interfacesoftware.com).

[34] Horwitch and Armacost present an article published in the Journal of Business Strategy entitled "Helping knowledge management be all it can be" (2002). This article attempts to persuade the reader that despite poor performance in past years of KMSs, competitive advantage using these systems can be achieved if deployment is carefully managed.

[35] Pinkett & O'Bryant (2003) address how to increase value through technological adoption as an urban studies and planning issue. Wenger (2004) addresses the issue of value from a social learning perspective. Wakeford (2003) addresses value creation by discussing methods for interpretation by individual community members.

[36] Kaplan and Norton authored the book Strategy Maps (2004). This book suggests ways to measure organizational performance and manage knowledge-based assets.

[37] For a detailed review on how information can be managed based on theoretical assumptions about knowledge within the community see Shultze and Leidner's article published in the journal MIS Quarterly in September 2002 entitled "Studying Knowledge Management in Information Systems Research: Discourses and Theoretical Assumptions".

the world.[38] This perspective is incompatible with Kaplan and Norton's perspective of knowledge as an organizational asset (although knowledge is not viewed as an asset, that does not mean that information is necessarily openly shared or unprotected from outside access[39]). Knowledge that emerges from the application of information through the daily practices of a group needs to be supported by technology differently than information that is to be applied for control and management of future actions.[40]

> "Through BCcampus educators receive development funds for creating online learning resources, access to a shareable online learning resources (SOL*R) repository, training and dissemination of best practices, and support for communities of interest." (Paul Stacey, 2007)

If we are to accept that knowledge is what communities have accumulated over time to understand the world and act effectively in it, then those who form the community membership must also actively manage[41] knowledge that is created (Wenger, 2004(a), p. 230). Knowledge management systems (KMSs) can be viewed as nothing more than a set of tools used to aid individuals in communication, supplying information that may be used by others when considering problems that seem similar in nature. In other words, KMSs provide an alternative medium for individuals to view and contribute to the practices of a community.

DESIGN CONSIDERATIONS

If ICTs are to support individuals and their contributions to the organizational learning process, then community members should become active participants in the design of these new technologies; individuals must begin asking questions about technical system designs and the way in which our communities are located within their production and use (Wakeford, 2003, p. 230). The involvement of individuals to guide the use of technological resources becomes more than just a question of matching business processes to system design and implementation principles,[42] individuals within the community where these systems are being applied must accept the constraints and limitations that are used to regulate behaviour within this digital space.[43]

The regulation of our behaviour, however, is only viewed negatively as a form of oppression when this regulation violates our social values. In fact, our fierce desire to protect and defend our national values provides a source of strength that we should use to create a digital environment that reflects our interests as independent organizations and Canadian citizens.[44] As such,

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[38] This perspective has been described by Deetz's taxonomy of organizational inquiry as an interpretive discourse (Shultze & Leidner, 2004).

[39] This perspective can be seen in practice by examining the Info-X, a professional group of avalanche forecasters who collectively gather data for analysis to create information. That information is compiled and released through park service bulletins of avalanche conditions. Although this information is protected due to both liability concerns and the difficulty associated with appropriate interpretation, the resultant information is not selectively manipulated or distributed as mandatory rules in an effort to create a particularly desirable result (a situation associated with asset management). The information is merely provided to the public who are responsible for incorporating this information into personal decisions about avalanche conditions.

[40] My arguments here have been greatly influenced by Brown and Duguid (1991) who present a persuasive argument for organizational transformation in their article entitled "Organizational Learning and Communities of Practice". This article outlines how organizations need to restructure to replace directive workplace documentation with systems designed to support communication and learning that emerges in the process of activities.

[41] There is some debate whether knowledge can be managed or merely supported—it is my view that KMSs are more accurately defined as those systems that manage information used to produce knowledge through computer applications or services. Hereafter, the term 'knowledge management' or its equivalences will refer to the management of that information which helps to produce knowledge for individuals within the community.

[42] Matching business process with design and implementation principles has been suggested by Horwitch and Armacost of Bain & Company consulting in their 2002 article "Helping knowledge management be all it can be" as the primary reason for lack of system effectiveness. This tactic places the blame for product inefficiency squarely on the implementation team and away from those who have actually designed the system—an interesting tactic from a company who is well known for charging vast amounts of money for the design of software applications and integration tools.

[43] For a comprehensive analysis on how behaviour is regulated within digital spaces, see Lawrence Lessig's book *Code and Other Laws of Cyberspace* (1999).

[44] Michael Ignatieff presents a persuasive stance within his OD Skelton Lecture given at the Department of Foreign Affairs and International Trade. This speech, entitled

fundamental design criteria should address questions of intellectual property, free speech, privacy and security, in a manner that reflects the values of the collective digital community—and perhaps the Canadian society generally.

Technical investigations

PLATFORMS, APPLICATIONS AND SERVICES

Addressing the role of information within cyberspace provides understanding for the rationale behind the design of ICTs such as knowledge management systems. To transition between the design of ICTs as a concept and the implementation of ICTs within the world of digital technology, we must establish a foundational understanding of the processes that occur in computer-to-computer interactions.

To begin this discussion, we must start with a computer. We tend to think about computers as those appliances that sit below our desk at home or office where we can check email or perhaps create a CV. In fact, the definition of a computer can encompass a huge variety of technology from Internet enabled cell phones to massive PBX (private branch eXchange) systems capable of supplying telephone service to over 20,000 users.[45] The ability for computers to interact is based on the open system interconnection (OSI) model (or in a simplistic version referred to as the TCP / IP protocol stack[46]).

An understanding of how computers interact does not necessarily require a detailed technical understanding of the underlying technology. It is important to understand, however, some basic terminology. First, the platform refers to the collective ability of software and hardware to provide general lower level and non-specific functions[47] for the user. One function of a platform is to allow for outputting data. On home computer systems, for example, the Microsoft Windows operating system enables the user to print information, or save it on disc. This functionality is provided by a combination of hardware and software that together is referred to as your (computer) platform.

Applications are directly tied to your platform. These applications provide the platform with the ability to provide task-specific functions by structuring the way the platform processes and presents data. Internet applications are designed to access information from the Internet in a defined manner. Microsoft Outlook, for example, is an application that is designed to send and receive digital mail. This application can access the functionality of the platform to display, store, or print the mail that has been received.

Web-based services provide data to applications in a format that is not dependent on the platform of the individual user. The ability to communicate between two computers is based on: the standardization that has occurred within the transportation of data across the physical network infrastructure, and the establishment of a common language (HTML[48] for example). That is to say that standardization has created the ability to establish communication (through standardized packets sent by the TCP / IP protocol stack over network cabling) and communicate coherently (through sending and receiving HTML, XML, or other data).

Once computers have established communication, web-based services provide data for a specific application (the Skype Internet telephone service provides communication packaging through the voice over Internet protocol). The application is responsible for interpreting this data and sending it to the platform for processing. The platform then presents this information to the user in the appropriate format (based on the computer's configuration). The Skype application, for example, would send and receive data from your Internet service provider and your computer platform, providing voice communication over the Internet through a headset and microphone.

"Peace, Order and Good Government: A foreign policy agenda for Canada" (2004), suggest that national values are supported by a responsible government that reflects these values in appropriate legislation and policy statements.

[45] PBX systems are specialized computers that provide connection to the public telephone system. Size and scalability of these systems vary.

[46] The TCP / IP or Transmission Control Protocol / Internet Protocol establishes communication through various levels of digital processing. The bottom level of the TCP / IP protocol stack of four layers, termed the network layer, converts signals transmitted over networking cables to data packets. These packets are then received by the Internet layer, recompiled by the transport layer and displayed by the application layer.

[47] 'Functions' used within the context provided here are generally referred to as services. Functionality has been chosen in order to avoid confusion between the provision of (platform) services and web services.

[48] HTML refers to Hypertext Markup Language and is a way of describing how data should be presented and interpreted by local computers. Web browsers are programs that translate HTML syntax to platform-specific instructions used to display, print or save information.

REFERENCING AND RECORDING INFORMATION

The independence of web services from platform-specific architecture can provide the ability to connect inherently different technologies.[49] This ability to cross boundaries within system architecture, however, is not inherent in the technology. The technology has no inherent nature at all. The use of standardized communication packaging in no way requires the use of standardized languages. In fact, the ability to alter the way in which the computer interprets data is now a fundamental part of web services.[50]

Altering how computers interpret data provides value by giving the application a structural context from which to view data that is received. By allowing the computer to maintain a specific and individual perspective, exploring complex relationships can be accomplished with greater efficiency. In the computer world, this individual perspective is based on a set of defined rules that allow the user to structure and reference information (much like colour-coded file folders and tabs are used to organize business information within a filing cabinet).

The explosion of new technology over the past twenty years has provided software developers with an overwhelming variety of tools for technological development. A quick tour of the computer section of the local book store will reveal volumes of books on C, C++, C#, Perl, Python, and PHP for programming; HTML, XML, XSL, and CSS for presentation / mark-up; and Flash, Illustrator, and Photoshop for graphic manipulation just to name a few. Each programming language has been used to create applications that store, retrieve and/or present information. Although a detailed review of these concepts is beyond the scope of this chapter, the information that follows will provide a valuable resource in this endeavour.

The technology infrastructure and management processes can provide information on the current state of organizational knowledge. Although measures for evaluating organizational knowledge would be imperfect at best,[51] it would provide system administrators with the information to make system design decisions based on behavioural patterns. (Integrating process management tools with design models will be covered in greater detail later in the chapter). Once patterns are recognized, system functionality can be developed based on these patterns. From this perspective, internal referencing not only determines how individuals navigate through a computer application, if designed correctly, referencing can provide continuous feedback for identifying changing patterns of behaviour.

Referencing

While referencing, applied within an organization, can provide insight into managerial practices, sharing this information externally can be accomplished by creating policies regarding access to this information (and enforcing these policies through system design). The creation of policies can ensure that direct and indirect stakeholder interests have been addressed when distributing organizational information. Aside from the policies related to the management and use of information externally, the technical process that makes this communication feasible must also be considered.

Referencing and exchanging electronic data effectively requires locating and describing data efficiently. Describing data helps the user or program determine relevance, while structuring the data allows the user or program to locate the data quickly. Once located, relevant data can be recorded (saved to disk or printed), linked (bookmarked for direct access to web pages for example), or distributed (data can be published within web pages, through subscription news feeds, or printed and given away). Efficient access to data through referencing provides extraordinary power and potential within a networked environment.

Because of the large amounts of data available, accessing it efficiently has become increasingly important.. Several types of structural formatting rules have been established and are publicly available to developers for review. Examples of these structural formatting rules include document type definitions (or **schemas**) and

[49] The technology used within a mobile cell phone that allows for Internet access is substantially different then that required by a server computer running a large electronic commerce operation, yet these two systems can communicate using the HTML language.

[50] Alterations of web-based languages are now common and developed under the framework of XML (eXtensible markup language), OWL (ontology web language), RDF, and other metalanguages. Metalanguages are used to define specialized terms and are standardized using document type definitions (DTDs). In turn, these DTDs allow industry work groups to create communication tools tailored to their needs.

[51] One such measure applied to communication technologies, suggested by Hoekman et al. (2004), is to measure the total interaction by monitoring the volume of voice telecommunication traffic and infer levels of both movement of people and trade / FDI flows (2004, p. 6).

older electronic data interchange (**EDI**) formats. These formatting rules are evolving and refining standards as developers build new features and capabilities into communication frameworks such as the eXtensible markup language[52] (XML).

One reason that the XML framework has been enthusiastically adopted stems from its ability to structure information in a flexible manner, allowing information to be grouped into related sub-topics. This grouping is especially useful when relating complex information between various computer applications. Unlike hypertext markup language (which formats data), XML can be used for situating data within a hierarchal structure.

For example, the data "Jenn Arden Brown" would use HTML markup syntax (… Jenn Arden Brown) to present the data in bold and italics: ***Jenn Arden Brown.*** XML markup would provide the semantic information (or field name in database terminology) used for adding context to the data using the following syntax:

```
<name>
   <first>Jenn</first>
   <middle>Arden</middle>
   <last>Brown</last>
</name>
```

In this case, the data can be integrated into both internal and external applications (assuming the data structures exist). For example, Microsoft Outlook may recognize XML structured data from a cellular phone application and automatically offer to store the data located within the <name> node (and subsequent <first>, <middle>, and <last> nodes) into your list of personal contacts.

Recording

Referencing locates and describes data for computer applications. Recording is used to store data between references. Perhaps the simplest way to record data is through printing the data onto paper, creating a physical copy that can be filed away, faxed to outside offices, or published on information boards. In the age of digital information, however, the amount of data available makes printing impractical for storing large amounts of information.

Printing was used historically for the storage of all data required by physical machines during the infancy of the computer industry.[53] Printing, as the predominant form of data storage, became outdated with the ability to reliably store information onto tape and disk technology. These three technologies are not completely dissimilar. Each requires information to be packaged and stored in a linear format. In fact, linear packaging of information (or serialization) is still the predominant method for recording information today. Image files (such as JPEG, BMP and MPEG), office documents (such as Word documents) and static HTML web pages all store information in a linear format. It is the responsibility of the application (web browser, photo editor, word processor) to read these files from start to finish, process the data, and present the information in a manner that can be understood by the user.

Although at a fundamental level all information within a computer is stored in a linear format,[54] advances in computer applications have provided greater flexibility in the packing and unpacking process. The ability for applications to process data is determined by their ability to apply specific rules during this process. Photo editors, for example, can usually interpret JPEG, BMP, and GIF images. These file types use standardized rules for presenting images. These rules can be incorporated into applications that are designed for the Microsoft, Linux, or Macintosh operating systems. Applications such as Internet Explorer, Photoshop, and GIMP (Gnu Image Manipulation Program) read the files from start to finish, apply rules for interpreting the data, and display the result to the user. This process works fine for relatively small packages of data.[55] Read-

[52] "Extensible Markup Language (XML) is a simple, very flexible text format derived from SGML (ISO 8879). Originally designed to meet the challenges of large-scale electronic publishing, XML is also playing an increasingly important role in the exchange of a wide variety of data on the Web and elsewhere." (W3C, 2005)

[53] Machines using a punch card operating system made their debut in 1965 and stored information as a series of physical holes in index cards. This technology formed "the first of three operating systems developed… It controlled the connected card readers, card punchers and high speed printers, and supported the classic card applications like reading, sorting, duplicating as well as the counting of the cards." (IBM, 2005)

[54] "By combining bits [0s and 1s] into a sequence, we can form binary representations that are equivalent to other representations of numbers." (Hyde, 2004, p. 22)

[55] Many photo editors, for example, can only interpret files that do not exceed 20 MB in an uncompressed format. This occurs because the program has only allocated 20 MB of computer memory for storing temporary versions of the

ing the entire contents within a file, however, quickly becomes impractical when searching large amounts of data (for example, you would not want to read a complete dictionary each time you needed to define a single word).

Because of these limitations, the ability to structure data began to evolve. One method used to structure information into manageable subgroups is to organize the data into horizontal rows (records) and vertical columns (fields). Using this structural format, it becomes possible to search through data that meets certain characteristics (such as all individuals with the first.name[56] value of Jenn). This technique for structuring data is referred to as a database.

Previously, the XML framework was used to describe how information can be referenced between computers. Although XML does not store data, which is physically stored in a linear text file, XML is a data model that can provide hierarchal structure. To clarify this, we revisit the previous XML example:

```
<name>
    <first>Jenn</first>
    <middle>Arden</middle>
    <last>Brown</last>
</name>
```

The data within this example is encapsulated within the tags <name> and </name>. In XML syntax, these tags can be described as opening and closing tags. In this case, the XML syntax references the node <name>, references the child node <first>, and inputs the data: Jenn. To externally reference (or exchange) this XML syntax with a database, we merely need to redefine how the computer application interprets the information. A database would interpret the XML syntax as follows:

Table 19.1

First	Middle	Last
Jenn	Arden	Brown

Within a database, additional rows (termed records) can be used to describe a long list of people. When reading this database, the application can search only the 'last' field within the 'name' table and present only records with the data 'Brown' within this field. Searching within a single field reduces the amount of data that requires processing by applications. A relational data model, such as a database, requires that all records contain the same number of fields. Conversly, the XML data model is hierarchical, allowing unused nodes to be omitted. This differentiation will be explored in greater detail when technology development is discussed later in the chapter.

Organizing

We live in a hexi-deminal world, a reality where meaning is conveyed through characters (written and spoken) and numbers (pure and applied).

General numeric expressions like (3 x 2) or (3 + 2) can be used to help organize content [(6 people in 2 groups of 3) for example]. XML and related technologies (XSLT, XPath, XPointer) do not validate and/or execute more complex exponentiated functions. However, exponentiated functions [(2 to the power of 8) or the (square root of 64)] are generally excessive for organizing information into a coherent and flexible format easily read by humans.

In short, XML technology provides a fast and flexible data framework / model with an ability to transport complex and deeply encoded files for additional processing (like streaming video). This technology can be seen in practice in the virtual world Second Life where XML—Remote Procedure Calls provide complex social and visual interactions (like dancing, talking and flirting).

Although database standards like ODBC lack certain flexibilities, they are adept at defining strict relationships between data sources. These often complex relations are valuable when referencing and processing a large number of records. New initiatives (by QD Technology in particular) have shown that queries can be sent and processed (using standardized ODBC compliant instructions) with compiled database sources. Although there are still graphical limitations, this marks a significant development in the organization and portable distribution of content.

file. If the program cannot completely load the file into memory, the image cannot be displayed.

[56] Programming syntax often uses the '.' to show relationships between, or to concatenate, variables. In this case, information stored in rows and columns is referred to as a table and is represented by '.name'. A field (information that describes a record) is given the name 'first', and is used to describe the record (the total information about one or more items), in this case, Jenn Arden Brown.

Splicing the information cable

Bridging the Gap Between Technology and Sociology

Just as raft guide trainees are faced with both social and technical challenges that must be addressed before guiding difficult whitewater rapids, so too must members of digital communities overcome social and technical barriers when contributing to online practices. Given these challenges, proper sequencing of content becomes an important component of facilitating community interactions. The following section addresses issues associated with the sequencing and facilitation of community interactions, the publication of community information,and the development of technological infrastructure that supports these ongoing processes.

DEVELOPING TECHNOLOGY

With the Palm, PocketPC, and Blackberry handheld computers struggling for market share against both notebook computers and cell phones enhanced with text messaging and digital photography, the push to provide consumers with better information management tools and applications is not surprising. Manufacturers are competing fiercely to guide, or perhaps monopolize and control, the adoption of technology created by exponential growth rates in processing and data transmission capabilities over the past four decades (Technotopian Delusions, 2005[54]).

Although these applications are often designed around the commercial interests of private firms, technological standards are working to integrate these disparate information sources. The eXtensible markup language (XML) is one such standard, playing an increasingly important role in this ability to exchange and integrate application data. Through the development of industry-specific document type definitions (**DTD**s), system developers can clearly define how information is extracted from structured XML documents and used in new software applications.

As the complexity of information systems increase, system architects and information technology professionals have begun to develop sophisticated tools for modelling and communicating these intricate system designs (termed unified modelling language [UML] notation). Although practical examples of UML notation will be given in the following section, it is important to note that development of this notation closely follows the growth of object oriented programming practices that encourage code reuse through clearly defined and independent program modules.

The technical advancements that allow for the distribution of information over the past decade—accomplished through standardized referencing and recording practices—are often highly structured and inflexible. These information systems have largely modelled organizational structures found within small companies that benefit from centralized control, usually associated with niche expertise. As a result of these referencing and recording practices, many organizations suffer from hierarchal communication channels and myopic management, and are usually not able to respond to rapid changes in business conditions (Bieberstein et al., 2005, p. 696). For this reason IBM researchers have adopted a new form of organizational structure termed the "On Demand Workplace".[57] This new organizational structure provides the framework for redefining our increasingly "organic organizations"[58] and strive to optimize the efficient exchange of information.

One method for efficiently exchanging information is by transporting data files using the hypertext transfer protocol (HTTP)—reliable message patterns (RMP). RMP is ideal in a networked environment. RMP provides transport of serialized content where distributed services can use XML-specific mid-tier processing.

Service oriented architecture

Frank Cohen suggests that service oriented architecture (SOA) is ideally suited to the loosely structured and decentralized communities emerging on the Web (FastSOA, p. 5). One tool available to the implementation of the service oriented architecture (SOA) implementation is the XML data model. Effective sharing between groups can be accomplished through policy enforcement regimes that use XML schema repositories (**XSR**s). Through XML referencing and recording of data, and

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57 The 'On-demand Workplace' is based upon the concept of a service oriented architecture (SOA). This "new organizational structure that optimizes the workforce and streamlines cross-unit processes to leverage the new IT systems" (Bieberstein et al., 2005[4], p. 696) is designed around the perception of core tasks and activities as 'units of service'. These units of service can be defined as differentiated, flexible, and team-based services that can be orchestrated (Bieberstein et al., 2005[4], p. 696).

58 Bieberstein et al. state that; "IT systems have evolved from mere tools and accelerators to an organic organizational entity. This new entity needs to be factored into the proposed structural design" (2005, p. 697) that has been created to orchestrate a chain of services from various teams in order to execute higher level tasks and business objectives (Beiberstein et al., 2005[4], p. 697).

effective sharing of information between groups, SOA can help define the relationship between the user and the software application.[59]

Flexibility, rapid development, and good scalability can be encouraged with the adoption of: a common notation (UML), and a defined data model (XML). In its most basic form, SOA is a technique for component software reuse (FastSOA, p. 84). The SOA design pattern is well suited to update data aggregation services and perform complex federated service requests (Fast SOA, p. 65). This task is not easily achieved in more structured languages such as **SQL**.

Simple object access protocol

Mid-tier processing is used to address the difficulties that arise when flexible XML technology is merged with a relational database management system (**RDBMS**). Common techniques for mapping data from XML files to database storage systems use the simple object access protocol (SOAP), which "allows us to pass structured, typed data in a decentralized, distributed environment" (Lecky-Thompson et al., 2005).

The SOAP—remote procedure call (RPC) uses exponentiated encoding to map XML data structures to **data objects** located within trusted memory resources allocated to programming languages. As a result, "SOAP-RPC bindings instantiate up to 15,000 Java objects to deserialize the SOAP request that contain 500 elements in the SOAP message body." (Perkins et al., p. 274).

The complex auto-binding ability that maps XML content to database storage (XML-RPC) should be used sparingly as files over 96kbs can have a dramatic impact on CPU and network bandwidth (FastSOA, p. 69). Alternatively, XML documents can be encoded literally, using SOAP-document-literal-encoding. SOAP-document-literal-encoding, however, does not allow you fine-grained control over the data source from Java.

Java and the Enterprise Java Bean

> EJB stands for "Enterprise JavaBeans" which are distributed network-aware components for developing secure, scalable, transactional and multi-user components in a J2EE environment. (Sun Microsystems, 2007)

[59] This relationship between the user interface and software application is defined by Bieberstein et al., as the Human Service Bus; an optimized organizational structure designed to meet the needs of the on-demand business environment (p. 698).

Java and PHP are both programming languages. Languages have advantages over document parsers when supplying complex mathematical and functional routine libraries. These libraries send requests for computer processing resources. For Java languages, this request is created within a Java container. The container often used for Java server page content is Project Catalina (Tomcat). Tomcat runs these libraries by establishing a trusted set of memory resources on the computer platform.

Trust is established within Java by using defined functional components as described by the Technology compatibility kits (TCK) developed through the Java community process (Dmitry A. Fazunenko, JDJ, p. 26). These technology compatibility kits (TCK) are distributed using the XML data model. TCKs ensure that vital information is distributed for the conformance testing of components such as the Enterprise JavaBeans (EJB), and are available upon subscription from Sun Microsystems.

The trusted memory resources restrict Java from accessing external resources. EJBs provide access to those restricted resources. This access is secured through highly defined relationships that coordinate and facilitate the transmission of information between the programming language and networking infrastructure. In other words, Enterprise JavaBeans can be described as a set of components that help to define a collection of properties (classes) and access points (interfaces) used to enhance interaction between the system and user.

LearningTimes, a web application, is one such example of a Java based community application. This application is built on open source (CommunityZero) technology and uses highly structured database technology distributed across multiple servers and multiple locations to offer secure, scalable, and reliable services.

XML document parsers

Data can be referenced, recorded, and organized using less complex and more flexible tools available in native-XML document parsers such as the document object model (DOM), streaming API for XML (StAX), or Java architecture for XML Binding (JAXB) to name just a few. XML document parsers work alongside your web-server (Apache, IIS, Lighttpd [Lighty], Cherokee) to organize data using arithmetic operators (addition/subtraction and multiplication/division) without the processor-intensive mathematical libraries available to Java, Perl, Ruby, or Python.

Although a detailed explanation of document parsers is beyond the scope of this chapter, the above document parsers provide access to objects from within programming languages. Each of these processing models offers alternative design patterns. Design patterns provide structure to application program logic. As such, "the structure of a program should mirror the structure of the data that it processes" (Kroenke, 1992, p. 274). Stated another way, XML document parsers should be selected based upon; 1) the data structure within the XML data model, and 2) how that data will be used by the programming language. Table 19.2 provides a brief description of where the XML parsers mentioned above offer performance advantages:

Table 19.2

XML Parsers	Description
Document Object Model	Suited to situations where all elements within the data structure need to be evaluated.
Streaming API for XML	Suited to situations where skipping unwanted sections of the data structure provides performance advantages.
Java Architecture for XML Binding	Suited for referencing large elements within the data structure where both control over the serialization process and validation as a set of properties (classes) by the Java Language are required.

Once formed, XML documents can be filtered and displayed. One tool for altering the style of XML content distributed online is the "XSL Specification, which lets you translate XML tags into other XML tags" (Sun Microsystems, 2007). These transformations can occur as a result of the native-XML parser's ability to 'close' the data model; ensuring the algebraic constructions are created in a logical manner.

One advantage of using XML document parsers is their ability to distribute data collection processes to mid-tier application servers. By transferring data collection processes to community led groups, complete authority over what data is created and how data is organized can encourage new and creative forms of contribution, greater coordination and alignment of efforts, and broader engagement in community discussions and initiatives. Community groups often use a variety of methods to publish content, including **wikis**, blogs and **RSS** feeds.

This authority to manage information within the community is critical in supporting the production of knowledge. When knowledge has been created through the application of information to relevant situations, a unique community perspective emerges.

At this point, the knowledge obtained by the community can be transformed and given structure by defining a document type definition (DTD). This DTD is the foundation for sharing community practices between various groups and sub-groups. Policies for sharing this information are then enforced through a validation process that is applied through XML schema technology. As the community develops these DTD and broader engagement in community initiatives occur, a variety of policies can be created and enforced using an XML schema repository.

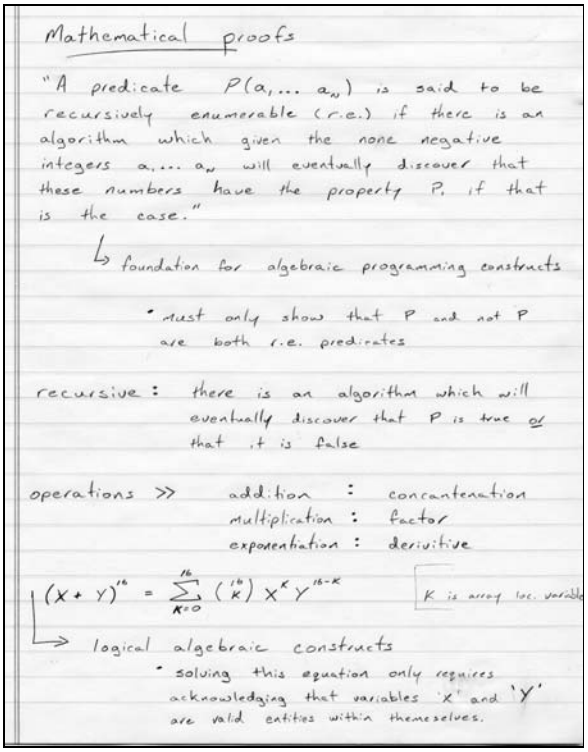
INTERACTING WITH TECHNOLOGY

So far we have tried to explain how the computer references and records information, using logical arguments and examples. Though these concepts are important to understanding technologies implementation, communication frameworks such as XML are rarely described as intuitive.

Perhaps it is this lack of intuitive understanding that constrains the adoption of technology within society, manifesting itself as a growing digital divide[60] between demographic and social groups within communities. This division has concerned industry leading experts in ICTs for over a half century,[61] but only recently have these concerns emerged as urgent and worthy of careful study. Today, with technology imposing on every aspect of daily lives, new initiatives, studies, and research have undergone explosive growth, resulting in the plethora of tools and applications designed to support the adoption and adaptation of technology and information.

[60] This term has been recently made popular by the initiatives such as the Premier's Technology Council of British Columbia [Canada] who have dedicated financial resources for the creation of NetWork BC; assisting communities and other government organizations to integrate technology into the everyday lives of BC residents (PTC, April 15, 2005).

[61] Vannevar Bush published an article in 1945 in Atlantic Monthly were he envisioned the personal computer (then termed the memex) as an integral part of communication (Freeman, 2005). He continues, however, by warning of the impacts of relying on computer indexing over free and transitory association of ideas between disciplines. Bush suggested that this transition could create such narrow specialization that "the effort to bridge between disciplines is correspondingly superficial" (Freeman, 2005, p. 337).



Mathematical proofs

"A predicate $P(a, \ldots a_n)$ is said to be recursively enumerable (r.e.) if there is an algorithm which given the none negative integers $a, \ldots a_n$ will eventually discover that these numbers have the property P, if that is the case."

↳ foundation for algebraic programming constructs

- must only show that P and not P are both r.e. predicates

recursive : there is an algorithm which will eventually discover that P is true or that it is false

operations >> addition : concantenation
multiplication : factor
exponentiation : derivitive

$$(x+y)^{16} = \sum_{K=0}^{16} \binom{16}{K} x^K y^{16-K}$$

K is array loc. variable

↳ logical algebraic constructs

- solving this equation only requires acknowledging that variables 'x' and 'Y' are valid entities within themeselves.

Mathematical proofs

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array (loc) variable

↳ logical algebraic constructs

- solving this equation only requires acknowledging that variables 'x' and 'y' are valid entities within themeselves

Notes on Algorithmic Information Theory by Chaiten (1987). Written by Shawn Berney (2005).

Publication

With the emergence of Internet in the home a mere decade ago, its presence has transformed communication, entertainment, and research.

Although economic and business principles have adapted to accommodate electronic commerce, perhaps the greatest impacts associated with the Internet occurred when "technology had collided so violently with journalism" (Gillmore, 2004, para. 19). This collision forever altered how individuals contribute to the community consciousness, creating "a conversation in which the grassroots are absolutely essential" (Gillmore, 2005, p. 50).

From the humble roots of hobbyist bulletin board systems that supported text-based games, electronic messaging, and file sharing, conversations began to develop into communities. These communities, frequented primarily by local individuals (due to the high cost of long distance phone service), began to thrive. Today the need for community planning initiatives is more important then ever before. "Aggregation is the name of the game, driving users away from search engines with a flat and bulky model of the net into the arms of specialist groupings and community-led sub-nets" (Howse, 2005). As the expectation of individuals to both access and publish information grows, greater demands have been placed onto administrators for features that allow sites to quickly and easily update site content. Today a wide variety of applications are available for publication, providing everything from photo galleries to real-time collaboration of complex documents and projects.[62]

> "However, inasmuch as a monthly newsletter contributes to a community rhythm, a ScoPE community blog (in the works!) would provide more timely updates. A blog does not reach the same audience as a community newsletter, so we are investigating ways to produce and manage both."
> SCoPe Case Study, written by Sylvia Currie

> "The Small City site allows for daily/weekly/monthly email notices of content updates and more re-

[62] Real-time collaboration software takes many forms and varies greatly in complexity. Microsoft uses a proprietary Sharepoint server, while the developer behind Lotus Notes has released a product called Groove Networks, which synchronizes individual computers. Within the academic world, services such as the LearningTimes platform provide interactive spaces for discussions, audience polls, and whiteboards.

cently a RSS feed has been added to help push communication about these activities out so that those interested in participation are made aware and can choose to participate if they want. All these are ways in which we are attempting to foster participation." Small Cities Case Study, written by Dan O'Reilly

Enhancing community

The abundance of technology has changed the lives of Canadians. Some researchers suggest that through open trade policies and the reduction of the barriers associated with adopting new technology, efficient distribution of information can be encouraged (Hoekman et al, 2004). Other researchers argue that, through targeted intervention, this information can be used to create new forms of learning and community practices. Though the analysis of trade policies may provide valuable insight into economic development of digital communities, we will focus here instead on the development of community learning. From this perspective, facilitating the integration of new information may provide insight into the manner in which individuals contribute to community practices, leaving the issues of personal and community economic development issues aside. If you are interested in this topic, there are several articles within the References section worth reading.

Facilitating the learning experience

Researchers have been increasingly addressing the complex issue of learning within a technologically diverse and complex social environment. Wenger (2004b) suggests that:

> "The challenges that we face today can be understood as learning challenges … [and] all these challenges require accelerated learning at multiple levels of scales at once, from individuals, to communities, to regions, to the whole world. But such deep and multi-scale learning is not simply a cognitive challenge; it entails a transformation of our very identities".

Provoking reflection and interpretation of new information supported by technological infrastructure can transform the way we engage with the world. Wenger suggests that these "complex situations where everyone belongs to very large numbers of different communities over the course of their lives and at any given time … [shows that] each person is a unique intersection of multi-membership" (Wenger, 2004b, p. 5). By leveraging this multi-membership and reifying the relationships between individuals,[63] IBM researchers suggest that contributions to information management practices can reflect the dynamic and flexible nature of human interaction.

Conceptually, Wenger suggests that the reason human interaction is dynamic and flexible is founded in our ability to negotiate new meaning and incorporate that meaning into our community involvement and identity (2004b, p. 5). Through facilitation, it may become possible for individuals to benefit from key factors that researchers such as Wenger suggest are critical within all communities of practices—providing stimulation to the learners' imaginations, aligning and coordinating of efforts between individuals, and engaging individuals in new practices (1998).

As technology continues to develop towards supporting newly created and dynamic teams, perhaps the facilitation of technology could benefit from group leadership and development skills. Techniques for developing these skills have been ingrained into the operational practices of leadership development and training centres such as Outward Bound and certification programs such as the Association of Canadian Mountain Guides. The following sections highlight selected techniques for developing these group leadership skills.

Facilitation techniques

Although group facilitation techniques are varied, adventure guiding researchers have identified several structural features that encourage behaviour that meets group expectations. These structural features include the group focus of activities, the use of metaphoric processing, and exposure to unfamiliar environmental conditions (Newes, n.d.). By manipulating these structural features facilitators can alter the amount of cognitive load required by participants, thus reducing stress and mental fatigue (Fabrizio & Niell, n.d., p. 6). While discomfort can initiate personal growth and development, substantial time and interaction must be provided. The proper sequencing of events and content can provide participants a natural progression towards full commu-

[63] Wenger's extensive research within the field of community development describes the situated nature of learning and provides the foundation for understanding how individuals develop meaning and identity within the community of practice (and the larger organization). Brown and Duguid's article, entitled "Organizational Learning and Communities of Practice", presents Lave and Wenger's social learning theory of legitimate peripheral participation, which suggests that the formation of knowledge occurs through collective learning and renegotiated meaning of past and future events, constructing a community practice.

nity participation and help individuals avoid potentially severe negative reactions that can result in social withdrawal.

If the individual adapts to the stressful new conditions the discomfort is temporary, and increases self-esteem and perceived competence.[64] To expedite this process, expectations should be realistic. Faciliated discussions can create an atmosphere of trust, cooperation, tolerance and integrity.

Within digital communities of practice, unfamiliar environmental conditions often challenge new participants of group oriented activities. These participants can easily become overwhelmed by new terminology and technological processes. Facilitating new information through techniques such as **debriefing** exercises, **front-loading** community activities, and metaphoric examples framed within a similar context (termed **isomorphic framing**) may help participants adopt, and adapt to, community information.

The use of facilitated debriefing provides the participants with the opportunity for active reflection and open communication following group activities. These debriefing exercises may address specific behaviour or, more generally, provide direction and help prioritize future initiatives. Debriefing is commonly used to facilitate a greater understanding of complex or stressful events to ensure that individuals comprehend and recognize a broad community perspective.

Alternatively, activities and events can be addressed in advance by highlighting common perceptions or actions and suggesting alternative behaviours. Front-loading community activities can be advantageous when attempting to avoid specific recurring and undesirable behaviours within community interactions. Front-loading community interactions can also be combined with isomorphic framing to provide subtle guidance relating to community expectations.

Sequencing

Developing strong interpersonal communication can also be supported through carefully designed and sequenced interactions. Just as facilitation requires specific and well timed intervention, participant development can be aided by well structured and implemented opportunities to engage community participants in the accomplishment of broad based group goals and objectives. These opportunities can be presented as valued components that require attention within the digital community. Using this methodology, participants have the freedom to specialize in areas of personal interest defined within the community, while community facilitators and educators support these contributions by integrating this information into community practice and conceptual understanding.

Carefully designing and planning alternative / candidate activities for community participants can also create sub-groups based upon experience and expertise. These sub-groups can provide valuable support as individuals experience discomfort, stress, and frustration related to new and unfamiliar practices. In turn, these unfamiliar practices will become more routine and individuals will begin to participate more fully in community practices.

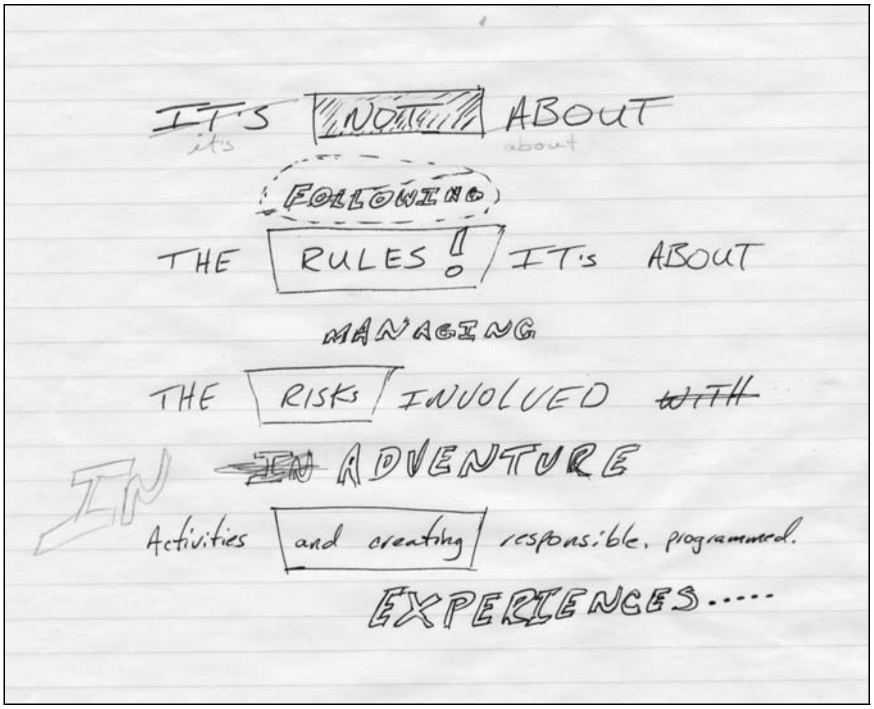
The architect . . .

> "I have come to the conclusion that software architecture is very difficult to define. It is a range of artifacts that are used to specify the strategic decisions about the structure and behavior of the system, the collaborations among the system elements, and the physical deployment of the system" (Quatrani, 2003).

While the previous sections focused on the sociological and technical foundations for building digital communities, this section works to address how these ideas can be integrated into a digital community's social fabric—its code. This section is dedicated to exploring tools used by software developers to communicate the complex relationships within digital communities. A basic understanding of these tools can increase the value and functionality of these emerging collaborative spaces. The tools can provide powerful working documents that encourage input from the diverse community members who populate these digital communities.

The system architect collects and analyzes software requirements then documents the required functionality for both the end user and the application. In an effort to standardize the communication of these complex relationships, system architects have begun to adopt notation techniques based on the unified modelling language (UML).

[64] This is reinforced by Newes who states, "[appropriate] sequencing also provides initial successes, or 'mastery tasks', fostering feeling of capability while counteracting internal negative self-evaluations, learned helplessness, and dependency" (Newes, n.d., Chapter 2: Sequencing of Activities).



It's Not About . . . Created by Shawn Berney (2005)

UML provides an abstract representation of complex relationships. This notation can be used to extend the efforts of social and technical investigations by providing a flexible and powerful communication framework. UML is a compilation of primarily three common, yet distinct notations (including OMT [Rumbaugh], Booch & OOSE [Jacobson]), and is now a fully recognized and published standard (ISO/IEC 19501:2005) within the International Organization for Standardization (ISO).

SYSTEM MODELLING

Structuring information is critical in facilitating highly dynamic and complex interactions. For raft guide trainees, structure is provided continuously through direct supervision. This instruction and supervision provides guide trainees with valuable feedback and insight into community practices and expectations. This feedback allows guide hopefuls to develop and contribute to the completion of a safe and enjoyable rafting experience. By clearly communicating how raft guide trainees can contribute to the professional rafting community, trainees can offer valued contributions without imposing on the guests' experiences.

Rafting companies provide much more than professional guides; they provide a carefully choreographed series of experiences designed to educate and entertain. The services must work to attain the highest quality guest experience.

The experience attained within a digital community can also be viewed as a series of choreographed and sequenced interactions. These interactions are influenced by both the architectural design of the digital community and the services provided by information managers during the implementation of the system architecture. The development of modelling tools have been successfully used to mediate these complex relationships, allowing individuals to communicate important system design information, system implementation processes, and the sequences and activities available for facilitating participation.

Use case diagrams

> "The most important role of a use case model is one of communication. It provides a vehicle used by the customer or end users and the developers to discuss the system's functionality and behavior." (Quatrani, 2003).

Describing how users will interface with highly structured computer information systems is an important and complex task. Developing technological infrastructure that efficiently models community practices requires a detailed understanding of how community members interact. Individuals with this knowledge are often referred to as domain experts. These experts are frequently charged with attempting to explain complex and informal information management practices. Use case diagrams are designed to visually represent these practices, capturing information that allows system architects and software engineers to ensure new technological solutions record and reference valued information only.

Activity diagrams

> "These diagrams represent the dynamics of the system. They are flow charts that are used to show the workflow of a system; that is, they show the flow of control from activity to activity in the system, what activities can be done in parallel, and any alternate paths through the flow … activity diagrams may be created to represent the flow across use cases or they may be created to represent the flow within a particular use case … Activity diagrams may [also] be created to show the workflow for an operation". (Quatrani, 2003).

Once the required information has been identified, system architects begin to evaluate the process for collecting and publishing the information for community access. Once again, domain experts—those individuals familiar with community practices—play a vital role in explaining the information requirements of community members. In this stage of system development, documentation provides insight into community participation by identifying the actions of community members. Ideally, these actions will be developed using a series of modular and reusable components.

Sequence diagrams

> "A sequence diagram shows object interactions arranged in time sequence. It depicts the objects and classes involved in the scenario and the sequence of messages exchanged between the objects needed to carry out the functionality of the scenario. Sequence diagrams typically are associated with use case realizations in the Logical View of the system under development". (Quatrani, 2003).

Once the program activities have been identified, software developers work to sequence the completion of these activities. Sequencing activities facilitates community participation by defining opportunities to engage in group goals and objectives. By carefully selecting how information system architecture imposes constraints upon community member interactions, digital communities can create carefully choreographed experiences.

Class diagrams

A class is an abstract representation of an idea (an approval class for example). Class diagrams are commonly used by software engineers to provide an abstract representation of programming logic (the connections between ideas, for example, ensuring approval status is obtained before allowing publication to occur). Programming logic is used to implement a technological solution that reflects the process of storing (recording and referencing) and retrieving (publishing and facilitating) digital information. Class diagrams also allow programmers to communicate the technical ability for software to integrate additional features or third-party modular extensions, an important component of implementing a SOA strategy.

THE APPLICATION OF UML

By sharing the process used to integrate new technological infrastructure, digital community practitioners can begin to selectively evaluate architecture found within various software packages. When this evaluation process is combined with community consultation, development initiatives can be prioritized and system integration requirements can be clearly defined.

The implementation process

These communication tools can be combined to create a solid process for managing the information lifecycle[65] and provide insight into the design and development of community infrastructure. The ability to derive processes from the business information model (such as UML diagrams) can be used to map information interaction patterns and facilitate the adoption of content (Hinkelman, Buddenbaum & Zhang, 2006, p. 375).[66] Existing data structures can be mapped and information transformed to enable data exchange between disparate information systems—a process "strategically important

[65] A recent article entitled 'Lifetime Value' by Karen S. Henrie offers a persuasive introduction to Lifecycle Information Management and published by Ziff Davis in CIOInsight (June 2006[69]).

[66] For a complete review of emerging standards for implementing design patterns that integrate information with process indicators see the complete article written by Hinelman et al. published in Volum 45[2] of the IBM Systems Journal entitled 'Emerging patterns in the use of XML for information modeling in vertical industries'.

for enterprises to increase information technology efficiency be reusing and integrating existing [data]" (Roth et al, 2006, p. 393).

Summary

The development of technological infrastructure that supports community interactions has seen explosive growth with the emergence of high speed and wireless Internet access. As these tools continue to develop, and tools for integrating disparate information sources become increasingly sophisticated, digital communities have the opportunity to expand and grow. To enhance this growth, greater community involvement in the planning and design of community infrastructure can be used to evaluate the barriers associated with participation. Visual modelling tools are merely one tool that can support this ongoing process of community consultation and development.

Visual models such as the UML notation techniques can help to educate community participants on how information is managed. These tools can also provide important insight into community design initiatives; allowing productive discussions about issues such as privacy, security, intellectual property, and architectural design to occur.

For the greatest community value, it is important to understand how society is being altered by digital technology. Working to inform community discussions can aid participants in understanding digital community design alternatives. These discussions should strive to include real world economic and financial considerations; allowing individuals to invest greater amounts of time and energy into digital communities.

Once individuals begin to invest time and effort into community initiatives, information managers must work to facilitate contributions to community initiatives and develop sequenced candidate plans that support community priorities. The ability to plan and structure digital community development using modelling techniques will allow new ideas to emerge and encourage the coordination and integration of new technological initiatives continually over time.

> "The first guiding value in hacker life is *passion,* that is, some intrinsically interesting pursuit that energizes the hacker and contains joy in its realization". – Pekka Himanen, *The Hacker Ethic,* p. 139

Glossary

Data Objects. A specific instance of a class (idea) used by computer programmers, for example, storing the data object 'Corvette' in the sports car class.

Debriefing. Also termed: processing, reviewing or reflecting. Debriefing is a deliberate process for drawing learning from experiences (Hirsch, 1999).

Des Aqua Derro. A phrase used almost exclusively in Patagonia region of South America. Des Aqua Derro can be literally translated from Spanish to 'Where Water Runs'. It describes the spot where the headwater pond becomes a river before descending from the high Andean plateau.

DTD. "Document Type Definitions are written in a formal syntax that explains precisely which elements may appear where in the document and what the elements' contents and attributes are" (Harold & Means, 2004, p. 28)

EDI. Electronic data interchange is a computer-to-computer transfer of business information. The American National Standards Institute (ANSI) helped to develop and maintain EDI standards in the late 1970s (Schneider, 2004).

Front-loading. Front-loading is based on the belief that the client may benefit from direction prior to participation in group activities. This direction should include specific objectives based on the facilitator's current assessment of group needs.

Hexi-decimal. Hexi-decimal representation is a 16 digit numbering system. This system uses the decimals 0 – 9 and characters A – F. The decimal number 200 or (200_{10}—the subscript specifically defines the numbering system) is equal to 11001000_2 in binary form, and $C8_{16}$ in hexi-decimal form. $C8_{16}$ can be stated in expanded representation as 8+[C x 16] just as the number 23 within the decimal system can be represented as 3+(2 x 10).

ICTs . Information and communication technologies is a broad term used to describe electronic systems which transmit and receive data for human consumption.

Isomorphic framing. Priest and Gass (1997) define isomorphism as "similar structures", going on to state that "an isomorph is an idea, object, or description that is identical in form or structure—but not necessarily composition or function—to another idea, object, or description … **Isomorphic framing** focuses on matching a client's needs, mind-set, and objectives with an … experience in such a way that successful completion of the … experience mirrors successful resolution of the client's issue" (p. 210).

RDBMS. A relational database management system is a method of storing related data in columns and rows. RDBMSs are searched using SQL syntax.

RSS. Really simple syndication is a publication format used to distribute aggregated data such as news feeds. RSS uses the XML data model.

Schema. "An XML schema is an XML document containing a formal description of what comprises a valid XML document" (Harold & Means, 2004, p. 278). XML schemas are used to enforce system policies through automated comparison and validation of content prior data aggregation.

SQL. Structured query language. "A language for defining the structure and processing of a relational database. Used as a stand alone query language and also embedded in application programs" (Kroenke, 1992, p. 642)

Wiki. A wiki is a web page which can be modified by viewers.

XSR. XML schema repositories are collections of schema documents.

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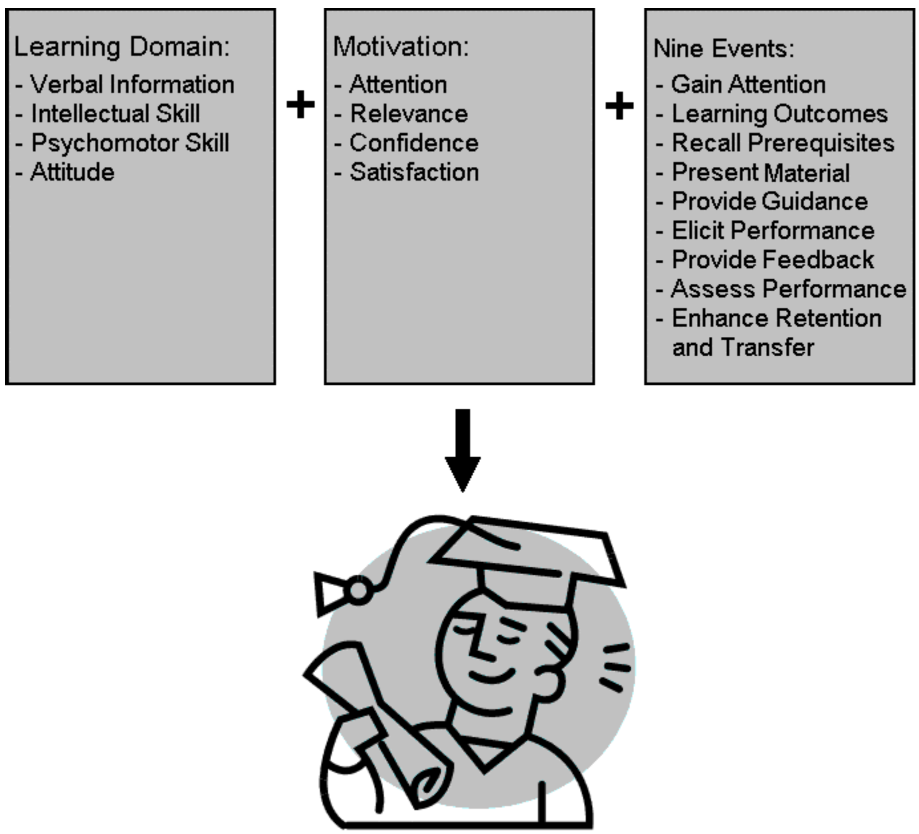
Part 4: E-learning in Action

20
Instructional Strategies

Peter Fenrich

For the things we have to learn before we can do them, we learn by doing them. – Aristotle



Learning outcomes

After completing this chapter, you should be able to:

- Develop instructional strategies for verbal information, intellectual skills, psychomotor skills, and attitudes.
- Sequence learning outcomes to best facilitate learning.
- Motivate learners in online courses.
- Design lessons that include all of the instructional events.
- Develop and select instructional materials.

Introduction

An instructional strategy describes the instructional materials and procedures that enable students to achieve the learning outcomes.

This chapter first introduces instructional strategies for verbal information, intellectual skills, psychomotor skills, and attitudes. It then describes how to sequence learning outcomes and motivate learners in online courses. It then presents instructional events, the foundation for course design. The chapter closes with comments on developing and selecting instructional materials.

Description

Your instructional strategy should describe the instructional materials' components and procedures used with the materials that are needed for students to achieve the learning outcomes. The strategy should be based on the learning outcomes and information from the other previous instructional design steps. You can even base your strategy on how you or others have solved similar problems. You can save time and money by not re-inventing the wheel. However, be careful; a lot of existing instructional material is designed poorly.

At the end of this process, you should have a clear set of specifications describing how the material will be taught. This can include a flowchart representing the instructional pathway. You will use the instructional strategy as a framework for further developing the instructional materials or evaluating whether existing materials are suitable or need revision. As a general rule, use the strategy to set up a framework for maximizing effective and efficient learning. This often requires using strategies that go beyond basic teaching methods. For example, discovery-learning techniques can be more powerful than simply presenting the facts. One common pitfall in creating online lessons is teaching in the same way as was done with traditional methods. If this is done, then there may only be minimal value in transferring the material to an online system. As Emile Chartier said, "Nothing is more dangerous than an idea, when it is the only one you have." Note that you can address a variety of learning styles if you teach with a variety of different methods and media. No one single teaching method or medium is ideal for all learners.

As you proceed through developing an instructional strategy, start specifying the media that would most effectively teach the material. (Read Chapter 21, Media Selection, for more information.)

Learning domain strategies

Each learning domain classification (i.e., verbal information, intellectual skills and cognitive strategies, psychomotor skills, and attitudes) is best taught with different instructional strategies.

Tip
Different classifications of skills require different instructional strategies.

VERBAL INFORMATION

When teaching verbal information:

- Organize the material into small, easily retrievable chunks. This is based on the cluster analysis shown earlier, in Table 20.1. The cluster analysis framework helps learners retrieve information from their memory as it provides cues to finding the information.
- Link new information to knowledge the learner already possesses. For example, use statements such as "Remember how", or "This is like …". Linking information helps the learner to store and recall the material.
- Use mnemonics and other memory devices for new information. You may recall that the musical notes of the treble clef staff lines can be remembered with the mnemonic Every Good Boy Deserves Fudge.
- Use meaningful contexts and relevant cues. For example, relating a problem to a sports car can be relevant to some members of your target audience.
- Have the learners generate examples in their minds, such as create a song or game with the information or apply the knowledge to the real world. If the student only memorizes facts then the learning will only have minimal value.
- Avoid rote repetition as a memorization aid. Rote learning has minimal effectiveness over time.

- Provide visuals to increase learning and recall.

INTELLECTUAL SKILLS

When teaching intellectual skills:

- Base the instructional strategy and sequencing on the hierarchical analysis done earlier. Always teach subordinate skills before higher-level skills.
- Link new knowledge to previously learned knowledge. You can do this explicitly (e.g., the bones in your feet are comparable to the bones you learned about in your hands) or implicitly (e.g., compare the bones in your feet to other bone structures you have learned about).
- Use memory devices like acronyms, rhymes, or imagery for information such as rules or principles. You can use the first letters of words to help memorize information. For example, "KISS" means "Keep It Simple Stupid". General rules can often be remembered through rhymes such as "i before e except after c". Remember that rules often have exceptions. Tell your learners about the exceptions. Memory devices are best for limited amounts of information.
- Use examples and non-examples that are familiar to the student. For instance, when classifying metals, iron and copper are examples while glass and plastic are non-examples.
- Use discovery-learning techniques. For example, let students manipulate variables and see the consequences.
- Use analogies that the learners know. However, be careful that learners do not over-generalize or create misconceptions.
- Provide for practice and immediate feedback.

PSYCHOMOTOR SKILLS

When teaching psychomotor skills:

- Base the instructional strategy on the procedural analysis done earlier.
- Provide directions for completing all of the steps.
- Provide repeated practice and feedback for individual steps, then groups of steps, and then the entire sequence.
- Remember that, in general, practice should become less dependent on written or verbal directions.
- Consider visuals to enhance learning.
- Consider job aids, such as a list of steps, to reduce memory requirements. This is especially important if there are many procedures or if the procedures are infrequently used.
- After a certain point, allow learners to interact with real objects or do the real thing. How much can you learn about swimming without getting wet?

Note that some skills involve other learning-domain classifications. For example, when learning how to operate a camcorder, many of the skills are psychomotor. However, deciding how to light an image is an intellectual skill. Also, note that the required proficiency level can affect the instructional strategy. There is a big difference between being able to imitate a skill and being able to automatically do a skill.

ATTITUDES

When teaching attitudes:

- Base the instructional strategy on the instructional design steps done earlier.
- If you can, show a human model to which the students can easily relate. One consideration is that it may be better if the model is of the same socio-economic group.
- Show realistic consequences to appropriate and inappropriate choices.
- Consider using video.
- Remember that attitudes taught through computer technology are **not** guaranteed to transfer to the real world. If appropriate and possible, consider arranging for practice opportunities to make the choice in real life. Alternatively, use role-playing to reinforce the attitudes taught.

Note that it can be difficult to test whether the attitudes taught have transferred to real situations. Will learners behave naturally if they know that they are being observed? If learners have not voluntarily permitted observations, then you must consider whether it is ethical to make the observations.

Sequencing learning outcomes

Using the subordinate skills analysis done earlier, determine the sequence of how the learning outcomes will be taught. In general, to best facilitate learning, you should sequence the learning outcomes from:

- lower to higher-level skills
  - For example, teach verbal information and then intellectual skills. Cover multiplying decimals with a calculator and then manually.

- easy to hard
  - You could teach adding fractions with common denominators and then with different denominators. Your lesson could first deal with writing complete sentences and then writing paragraphs.
- simple to complex
  - As an example, teach recognizing weather patterns and then predicting the weather. Cover replacing a washer and then replacing a faucet.
- specific to general
  - You could teach driving a specific car and then transfer the skills to driving any car. Similarly, you could cover adjusting the brakes on a specific mountain bike and then generalize the procedure to other mountain bikes.
  - Note that some students like to learn through an inductive approach (that is, from the general to the specific). For example, students could be presented with a number of simple examples, and based on those, be asked to generalize a rule. That general rule can then be applied to solving specific examples. Since some students will not enjoy an inductive approach, do not use it all of the time. Rather consider an inductive approach as a way to provide some variation and occasionally address other learning preferences.
- concrete to abstract
  - As an example, teach measuring distances with a tape measure and then estimating distances without a tape measure. Cover writing learning outcomes and then evaluating learning outcomes.
- the known to the unknown
  - You could do this by starting with concepts learners already know and extending those concepts to new ideas. In other words, build on what has been previously taught.

Tip
Be sure to teach learning outcomes in the order that best facilitates learning.

Each of these methods of sequencing learning outcomes enables students to acquire the needed knowledge base for learning higher-level skills. Note that these guidelines are **not** black and white rules.

Motivating students

As Lao Tzu observed, "You can no more teach without the learner than a merchant can sell without a willing buyer." Follow the ARCS motivation model to ensure that students will be motivated to learn.

Tip
Motivate learners because without motivation learning is unlikely to occur.

ARCS MOTIVATIONAL MODEL

As described by Keller, motivation can be enhanced through addressing the four attributes of *Attention*, *Relevance, Confidence*, and *Satisfaction* (ARCS). Try to include all of the attributes since each alone may not maintain student motivation. Your learner analysis may have provided useful information for motivating students.

You should build motivational strategies into the materials throughout the instructional design process. This is challenging since each learner is an individual with unique interests, experiences, and goals.

Tip
Carefully determine your motivational strategies since each learner has unique interests, experiences, and goals.

ATTENTION

Gain attention and then sustain it. You can gain attention by using human-interest examples, arousing emotions such as by showing a peer being wheeled into an ambulance, presenting personal information, challenging the learner, providing an interesting problem to solve, arousing the learner's curiosity, showing exciting video or animation sequences, stating conflicting information, using humour, asking questions, and presenting a stimulus change that can be as simple as an audio beep. One way to sustain attention is by making the learning highly interactive. Figure 20.1 shows an attention-grabbing strategy.

Figure 20.1. Gaining attention with an explosion

RELEVANCE

Relevance helps the student to want to learn the material. For example, when teaching adult students how to solve percent problems, having them calculate the gratuity on a restaurant bill may be more relevant than a problem that compares two person's ages. You can provide relevance through testimonials, illustrative stories, simulations, practical applications, personal experience, and relating the material to present or future values or needs. Relevance is also useful in helping to sustain attention.

For material to be perceived as being relevant, you must strive to match the learner's expectations to the material you provide.

CONFIDENCE

If students are confident that they can master the material, they will be much more willing to attempt the instruction. You will need to convince students with low confidence that they can be successful. You can do this through presenting the material in small incremental steps, or even by stating how other similar students have succeeded. Tasks should seem achievable rather than insurmountable.

You should also convince students who are overconfident that there is material that they need to learn. You can do this by giving a challenging pre-test or presenting difficult questions.

SATISFACTION

Satisfaction provides value for learning the material. Satisfaction can be intrinsic from the pleasure or value of the activity itself, extrinsic from the value or importance of the activity's result, for social reasons such as pleasing people who's opinions are important to them, for achievement goals such as the motive to be successful or avoid failure, or a combination of these. Examples of intrinsic satisfaction include the joy or challenge of learning, increased confidence, positive outcomes, and increased feelings of self-worth. Examples of extrinsic satisfaction include monetary rewards, praise, a certificate, avoidance of discomfort or punishment for not doing it, and unexpected rewards. Some evidence suggests that extrinsic motivation, such as a certificate for completing a course, does not last over time. Nonetheless, it is better to assume that some students need extrinsic motivation. To be safe, try to provide your learners with both intrinsic, which should have more of the focus, and extrinsic rewards. If the intrinsic motivation is high for all learners, you will not need to plan as much for extrinsic motivation. Note that satisfaction can be provided by enabling learners to apply the skills they have gained in a meaningful way.

Remember to let the students know that the material to be learned is important. Consider increasing extrinsic motivation through quizzes and tests.

Instructional events

As Robert Gagné described, the instructional events (gaining attention, informing the learner of the learning outcome, stimulating recall of prerequisites, presenting the material, providing learning guidance, eliciting the performance, providing feedback, assessing performance, and enhancing retention and transfer) represent what should be done to ensure that learning occurs. If you address each instructional event, you will have a solid foundation for creating effective instructional materials. You will need to determine what will be done for each instructional event for each learning outcome.

GAINING ATTENTION

Gain attention by getting the students involved and motivated. Ideas for gaining attention were presented earlier within the ARCS model of motivation above.

Consider using an interesting animation or video on the title page and first screen of each lesson. This is called an attract sequence. Note that video tends to be more effective than still images in gaining attention.

Remember that you also have to keep the learners attentive throughout the entire lesson. You can maintain attention by using different media, leading lively discussions, asking questions, providing different learning activities, etc.

INFORMING THE STUDENT OF THE LEARNING OUTCOME

Help students focus their efforts in this event. You can do this with simple statements or thought-provoking questions. If possible, also make the students feel that they need to learn the knowledge and skills.

You can let the learner know about the learning outcome in an introduction or overview. This can be a good use for video, since some students skim over text as they find it boring.

STIMULATING RECALL OF PREREQUISITES

Prepare students for what is to come in this event. One strategy you can use is simply stating the needed prerequisite skills. Alternatively, pre-tests can remind learners of the prerequisites and also help to determine a student's current skill level. You should advise students who do not have the prerequisite skills to learn the skills before continuing. Stimulating recall of prerequisites should be done before major learning occurs. This is often done in an introduction or overview.

The learner analysis should have previously determined the relevant knowledge and experiences that typical students will bring into the learning situation.

PRESENTING THE MATERIAL

When presenting material to the students in this event, in general, you should sequence the material in increasing difficulty and in small incremental steps. This helps ensure success and increases learner confidence.

A variety of methods can inspire interest. No single approach can be used to teach all learning outcomes, but the activities you choose must effectively address the learning outcomes and different learning styles. As much as possible, the activities learners do online should match what will be done in the real world. Learning by doing is very powerful. As the Buddha said, "Teach you? I cannot teach you. Go, experience for yourself."

Tip
Use a variety of methods to teach.

Where appropriate, the instructional activities you create should include fun ways to learn. However, remember that some learning is simply hard work. Every instructional activity can have strengths and weaknesses, depending on the learning outcome being taught. Incorporating a variety of creative instructional approaches can help maintain student interest and motivation as well as ensure that each student occasionally has a match between their learning style and the teaching style. Many effective lessons include more than one type of instructional activity.

Tip
Try to make learning fun.

Remember to provide examples that are meaningful, relevant, and realistic. Base some of the content on the potential for making mistakes. Get this information by asking subject-matter experts about typical mistakes students make after they are taught the content in the traditional way. If you only teach what is correct, the learner may never learn what can go wrong. For example, teaching what can go wrong is important in teaching physicians how to make an accurate diagnosis.

Tip
Consider teaching both the correct material and what can go wrong.

Base the total amount of material presented in a lesson on the learners' age and assumed attention span, the material's complexity, the activities needed, and the time needed for all of the instructional events. A rough estimate of the proportional amount of effort needed to cover a learning outcome should be based on the learning outcome's frequency, importance, and difficulty.

- Frequency—How often is the behaviour needed?
- Importance—How significant is the behaviour to job performance?
- Difficulty—How hard is the behaviour to master?

For each learning outcome, give a rating (e.g., a number out of five) for the frequency, importance, and difficulty and then add the total. Base the estimated amount of content (e.g., a percentage of the number of screens) proportionally for each learning outcome. Table 20.1 shows an example.

You can gain ideas for presenting the material through brainstorming with all team members, other instructors, resource personnel, and even target audience learners. You can also review existing materials for ideas. You should not be responsible for generating all of the creative ideas yourself. When thinking about ideas, remember that people are social. Collaboration and discussions can be powerful in enhancing learning and can easily be done through computers and the Internet. In groups, students can discuss, debate, and explore many things. Imagine how much can be learned if students discuss issues or explain concepts to each other. As Giambattista Vico said, “One only knows something if one can explain it”. Also through computers, it is possible to tap into real data or tools such as those used by scientists. Wouldn’t students enjoy learning about climate, for example, if they could use real data and models to predict the weather?

Table 20.1

Objective	Frequency	Importance	Difficulty	Total	Percent
Number 1	2	1	1	4	10%
Number 2	4	3	5	12	30%
Number 3	2	3	3	8	20%
Number 4	3	1	2	6	15%
Number 5	1	5	4	10	25%
Total				40	100%

Depending on the learning outcome, you may need to teach some of them or support them through computer-based resources when the more common online strategies will not suffice. Computer-based resources include drill and practice, tutorials, simulations, online labs, educational games, intelligent tutoring systems, and virtual reality. These are described in Chapter 22, Computer-Based Resources for Learning. Some drill and practice activities can be effectively provided within Learning Management Systems. However, depending on the learning domain, thinking level required, complexity of the problem presentation, and feedback that needs to be provided, some drill and practice activities will need to be created with specialized tools such as Macromedia Flash.

PROVIDING LEARNING GUIDANCE

In helping students to learn the material, you can provide ways to categorize materials, provide memory devices, and link new knowledge to previously learned knowledge. You can also emphasize differences between related skills. As an example, you might explain that adding two digit numbers is similar to adding single digit numbers, except that a value may have to be “carried”. You can also provide students with strategies for recalling information and encourage them to create their own memory recall techniques. Providing guidance is particularly important because many students have not learned how to learn effectively.

Remember that learning is minimal if you simply provide information. As Paulo Freire said, “To teach is not to transfer knowledge but to create the possibilities for the production or construction of knowledge”.

This event is usually integrated with “presenting the material”.

ELICITING THE PERFORMANCE

Learners must know how well they are progressing. You can do this by asking questions or providing opportunities to practise the skill being taught and then giving feedback. This event is also usually integrated with “presenting the material”.

It is better to provide a little bit of practice often as compared to a lot of practice given seldom. Allow for practice as learners logically need it after each concept of a lesson has been presented, rather than at a fixed interval such as at the end of each lesson after many concepts have been presented. This is even more important when learners need to practise sub-skills before proceeding to higher-level skills. In other words, help learners learn the material as the content is taught. Learning effectiveness can be compromised if you wait too long.

Make the difficulty level of the practice proportional to the difficulty of the task. Practice should not be so easy that it is trivial nor so difficult that it is frustrating. Remember to also check whether the learner makes expected mistakes.

Metacognition is an important step in eliciting the performance. Metacognition can be defined as your knowledge and understanding about your own mental processes, as well as how you actively control and monitor your memory, comprehension, and other thinking processes involved in planning to learn, learning, and assessing your learning. In simple terms, metacognition is a self-questioning strategy that entails “thinking about thinking”.

To address metacognition, learners can be prompted to answer questions such as:

- “How do I learn best?”
  – Answers to this question relate to the individual’s learning style. For example, the learner may study best in a quiet area.
- “How does the nature of the task affect my decisions regarding learning the material?”
  – The learner needs to think about issues such as the difficulty of the task. This can impact the time needed for learning the material.

  - The type of task is also a factor. A common situation is that learning material needed for answering multiple-choice questions is different from studying for long-answer questions.
- "Do I have the time needed to do the task?"
- "For this type of task, what strategies work best for me?"
- "Am I motivated to do the task? If not, what needs to change?"
- "What related skills do I already know how to do or need to learn?"
- "How do I know that I have learned the concept?"
- "What did I learn from making that error?"
- "How well am I progressing?"
- "What do I still need to learn?"
- "How well is my plan and learning strategy working?"
- "Should I change my plan and learning strategy?"
- "What could I have done differently?"
- "What should I have done differently?"
- "How can the mental processes I used work for learning other content?"

PROVIDING FEEDBACK

Your feedback should be positive, constructive, and immediate. It should provide complete information as to why their answer and other possibilities are right or wrong, and/or guide students towards attaining the learning outcome. Detailed feedback is important to ensure understanding, especially if the learner's answer was simply a guess or if the learner's answer was correct but the reasoning was wrong. This event is coordinated with eliciting the performance.

ASSESSING PERFORMANCE

Students are tested in this event. This step is basically more formal than the "elicit the performance" event. As much as possible, the tests you create should approximate real situations. Test all learning outcomes and only the learning outcomes. Tests should be criterion-referenced (that is, performance based on achieving the specified learning outcomes).

You should provide the students with their test results as soon as possible. The feedback you provide should pinpoint areas in which the student had difficulties.

ENHANCING RETENTION AND TRANSFER

In this event, ensure students retain the information and that the information can be transferred beyond the specific ideas presented in the lesson. More exposure leads to more retention. You can increase retention through questioning, giving reviews, paraphrasing, and providing summaries. Retention activities should occur at spaced intervals and occur before more complex skills are learned.

Tip
Increase retention by exposing the learner to the material in a variety of ways.

You can facilitate transfer by providing links to related situations, related information, or novel problems and solutions. If possible, transfer should focus on real-world situations.

Develop and select instructional materials

Based on the instructional strategy for each learning outcome, and information from the other steps of the instructional design process, you need to determine whether materials should be gathered or developed. The main reason for using existing materials (those owned by your institution or purchased) is to save time and money.

GATHER EXISTING MATERIAL

Some but likely not all of the needed material may exist. Potential resources can be found in learning-object repositories, other Internet resources such as Wikipedia, and on DVD-ROMs. Learning-object repositories may be found within your institution or at provincial/state, national, and international sites. Compare any existing material to the instructional strategy. Determine whether it is suitable and cost-effective. You may prefer existing materials if the content you would develop will be obsolete before or soon after you complete it. You may have to deal with the "if we didn't make it, it can't be any good" syndrome.

Determine whether the existing material can be adapted or supplemented. One alternative is to get permission to repurpose existing materials for your own needs. Remember, if you include work done by others, you may not have permission to earn money from your product. However, you may be able to work out a revenue-sharing agreement.

Note that not all copyrights will be cleared, and some promised materials might not be provided.

Remember to check all digital materials for viruses.

DEVELOP THE NEEDED MATERIAL

The instructional strategy of the materials you develop should consider the learning domain, motivational techniques, each event of instruction, and all of the information gained through the systematic instructional design process. It is wise to create a paper-based version (storyboard) of what will appear on each screen that a student will see. The screen sample is shown in Figure 20.2. Storyboards are easier to review and edit than content within a learning management system.

Tip
Thoroughly evaluating a storyboard can help prevent the team from wasting a significant amount of time making revisions.

The following storyboard example shows that two video clips need to be created for the question. The first video clip needs to be seen to answer the question. The second video clip is presented as part of the feedback. The text stating "Answer: False" is information needed for answer, judging when the storyboard is transferred to the computer-managed learning system. The feedback is presented after the learner answers the question.

Video for the question:

A teacher being animated and talking energetically while **standing still** and saying:

"Lao Tzu stated, 'You can no more teach without the learner than a merchant can sell without a willing buyer.'"

Video for the feedback:

The same teacher being animated and talking energetically while **moving around** and saying:

"Lao Tzu stated, 'You can no more teach without the learner than a merchant can sell without a willing buyer.'"

Review Question 8

True or false? The teacher effectively presented the quote.

Click on "Play" to watch the video to answer the question.

Answer: False

Feedback:

This example does NOT show the most effective way to present the quote because the teacher was standing still. You should create energy by moving around as you speak, being animated, and showing your enthusiasm.

Click on "Play" to see how the quote should have been presented.

Figure 20.2—Storyboard for a sample screen

The storyboard must be written and designed for the computer screen. If this is not done well, time must be spent adapting the material. If possible, follow standardized specifications to help with consistency. Consistency is important as it makes it easier for learners to learn. A lack of consistency can lead to learner frustration. Attain consistency by using design templates but ensure that the templates do not inhibit creativity or compromise learning.

Leave room for visuals on the screen or insert digitized images and try to estimate the amount of text that is reasonable for each screen. A problem with trying to exactly match storyboards to computer screens is that the video images, visuals, and text can take more or less space than expected. It is not necessary to have the media at this point. For example, text and dialogue scripts can describe what video and audio will contain while text can be used to describe photographs.

Initially work with one typical learning outcome and evaluate the storyboard before continuing with other learning outcomes. This helps prevent problems from being perpetuated throughout a course. After the entire storyboard is written, distribute the storyboard or pin it up and ask for feedback from other subject-matter experts, especially others who will use the product, and from potential learners. Thoroughly evaluate the material for flow, clarity, accuracy, completeness, pace, interaction, and length. As a general rule, if the storyboard has problems, then the material will have problems when it is transferred to the learning management system. Remember that the final version will be inherently better when the media is added.

Tip
If you develop, review, and revise one learning outcome at a time, you can prevent problems from being copied throughout the course.

Expect to make revisions. After the first learning outcome has been transferred to the computer, thoroughly evaluate it. After revisions have been made, continue developing subsequent learning outcomes and lessons. Repeat the revision and evaluation process as often as is needed for each learning outcome, group of learning outcomes, and lesson.

Based on the storyboard, make final decisions about the media needed to effectively teach the material. These decisions are based on what will most effectively teach the material as well as practical considerations such as cost and available expertise. Once you make the decisions, start creating the media. You must consider the file formats that will be used and where the media will be stored, such as DVD-ROM, CD-ROM, Internet, or intranet. (Practical considerations for this and media selection are presented in Chapter 21, Multimedia.)

A final storyboard must be created for the person who transfers the material to the learning management system. An accurate storyboard will reduce the number of subsequent revisions needed. After you develop the media, individual pieces can be incorporated into the system. After this, you can begin the final formative evaluation.

The components of a complete instructional multimedia package can also include:

- an easy-to-use student manual with directions, strategies, learning outcomes, and summaries
- remedial and enrichment material
- an easy-to-use instructor's manual

Summary

An instructional strategy should describe the instructional materials' components and the procedures used with the materials needed for students to achieve the learning outcomes. Your instructional strategy should be based on your instructional analysis, the learning outcomes, and other previous instructional design steps, or on how others have solved similar problems. At the end of this process, you should have a clear set of specifications describing how the material will be taught. You will use the instructional strategy as a framework for further developing the instructional materials or evaluating whether existing materials are suitable or need revision.

Consider strategies that go beyond basic teaching methods. Remember that you can address a variety of learning styles if you teach with a variety of different methods and media. No single teaching method or medium is perfect for all learners. As you proceed through developing an instructional strategy, start specifying the media that would most effectively teach the material.

Each learning domain classification is best taught with different instructional strategies.

When teaching verbal information:

- Organize the material into small easily retrievable chunks, based on the cluster analysis done earlier (see Table 20.1).
- Link new information to knowledge the learner already possesses.
- Use memory devices like forming images or using mnemonics for new information.
- Use meaningful contexts and relevant cues.
- Have the learners generate examples in their minds, do something with the information, or apply the knowledge to the real world.
- Avoid rote repetition as a memorization aid.
- Provide visuals to increase learning and recall.

When teaching intellectual skills:

- Base the instructional strategy and sequencing on the hierarchical analysis done earlier.
- Link new knowledge to previously learned knowledge.
- Use memory devices like forming images or mnemonics for new information.
- Use examples and non-examples that are familiar to the student.
- Use discovery-learning techniques.
- Use analogies that the learners know.
- Provide for practice and immediate feedback.

When teaching psychomotor skills:

- Base the instructional strategy on the procedural analysis done earlier.
- Provide directions for completing all of the steps.
- Provide repeated practice and feedback for individual steps, then groups of steps, and then the entire sequence.
- Remember that, in general, practice should become less dependent on written or verbal directions.
- Consider visuals to enhance learning.
- Consider job aids, such as a list of steps, to reduce memory requirements.
- Allow learners to interact with real objects or do the real thing.

When teaching attitudes:

- Base the instructional strategy on the instructional analysis done earlier.
- If you can, show a human model to which the students can easily relate.
- Show realistic consequences to appropriate and inappropriate choices.
- Consider using video.
- Remember that attitudes taught through computer technology might not transfer to the real world.
- Note that it can be difficult to test whether the attitudes taught have transferred to real situations.

Based on the subordinate skills analysis done earlier, sequence the learning outcomes from lower to higher-level skills, easy to hard, simple to complex, specific to general, concrete to abstract, and/or the known to the unknown.

It is important for your lessons to motivate learners because without motivation learning is unlikely to occur. Motivation can be enhanced through addressing these attributes: Attention, Relevance, Confidence, and Satisfaction (ARCS). Try to include all of the attributes since each alone may not maintain student motivation. You should build motivational strategies into the materials throughout the instructional design process.

The instructional events represent what should be done to ensure that learning occurs:

- To gain attention, involve and motivate the students. Do this throughout the lesson.
- Inform the student of the learning outcome, before major learning occurs, to help them focus their efforts.
- Stimulate recall of prerequisites by stating the needed prerequisite skills or giving a pre-test.
- When presenting the material, sequence the material in increasing difficulty and in small incremental steps. Use a variety of methods to maintain interest. Provide examples that are meaningful, relevant, and realistic. Base some of the content on the potential for making mistakes. The proportional amount of effort needed to cover a learning outcome should be based on the learning outcome's frequency, importance, and difficulty.
- While presenting the material, provide learning guidance to help students learn the material.
- While presenting the material, elicit the performance so that learners can find out how well they are doing. Do this by asking questions or providing opportunities to practise the skill. Remember to address metacognition within this activity.
- When eliciting the performance, provide detailed feedback. Your feedback should be positive, constructive, and immediate. Your feedback should provide complete information as to why the answer and other answers are right or wrong or guide students in how to attain the stated learning outcome.
- Formally assess the students' performance. Tests should approximate real situations. Test all learning outcomes and only the learning outcomes. Tests should be criterion-referenced.
- Enhance retention and transfer so that students retain the information and can transfer the information beyond the specific ideas presented in the lesson.

Each type of instructional activity has strengths and weaknesses depending on the problem being solved. Incorporating a variety of creative instructional approaches can help maintain student interest and motivation as well as ensure that each student occasionally has a match between their learning style and the teaching style. Many effective lessons include more than one type of instructional activity, some fun ways to learn, and social activities like collaboration and discussions.

Based on the instructional activities for each learning outcome, and information from the other steps of the instructional design process, you need to determine whether materials should be gathered or developed. The main reason for using existing materials (those owned by your institution or purchased) is to save time and money.

The instructional strategy of the materials you develop should consider the learning domain, motivational techniques, each event of instruction, and all of the information gained through the systematic instructional design process. It is wise to create a paper-based version (storyboard) of what will appear on each screen that a student will see. Storyboards are easier to review and edit than content within a learning management system. Based on the storyboard, make final decisions about the media needed to effectively teach the material. After you develop the media, individual pieces can be incorporated into the learning management system. After this, you can begin the final formative evaluation.

Glossary

ARCS. Refers to the attributes Attention, Relevance, Confidence, and Satisfaction. The ARCS model promotes student motivation.

Attitudes. Tendencies people have to making particular decisions or choices under specific circumstances.

Cluster analysis. Used to organize verbal information into logical groupings that are small enough to be learned successfully.

Discovery learning. A method of teaching where learners learn information, such as a concept, that has not been directly stated. For example, by allowing learners to change one of two related variables and see the consequence on the other, learners can discover the relationship on their own.

Feedback. Any message or display that you give to a learner based on his or her input.

Hierarchical analysis. Used to determine the subordinate skills required to learn each intellectual skill.

Instructional events. Events that ensure that learning occurs. These events include gaining attention, informing the learner of the learning outcome, stimulating recall of prerequisites, presenting the material, providing learning guidance, eliciting the performance, providing feedback, assessing performance, and enhancing retention and transfer.

Instructional strategies. Components of a set of instructional materials and the activities that the students must do to achieve the learning outcomes.

Intellectual skills. Skills that require learners to think (rather than simply memorize and recall information).

Learning outcomes. Specific measurable skills.

Learning styles. Characteristic behaviours that indicate how students prefer to learn. Also known as cognitive styles or learning preferences.

Metacognition. An individual's knowledge and understanding about their own mental processes; how one actively controls and monitors their memory, comprehension, and other thinking processes involved in planning to learn, learning, and assessing their learning.

Procedural analysis. Used to derive subordinate psychomotor skills.

Psychomotor skills. Those skills that enable learners to carry out muscular actions.

Storyboards. Paper-based scale replica drafts of each screen that will appear on the computer.

Subordinate skills analysis. A process for determining the skills that must be learned before performing a step.

Verbal information. Material, such as names of objects, that students simply have to memorize and recall.

Wikipedia. A web-based, multilingual, free content encyclopedia.

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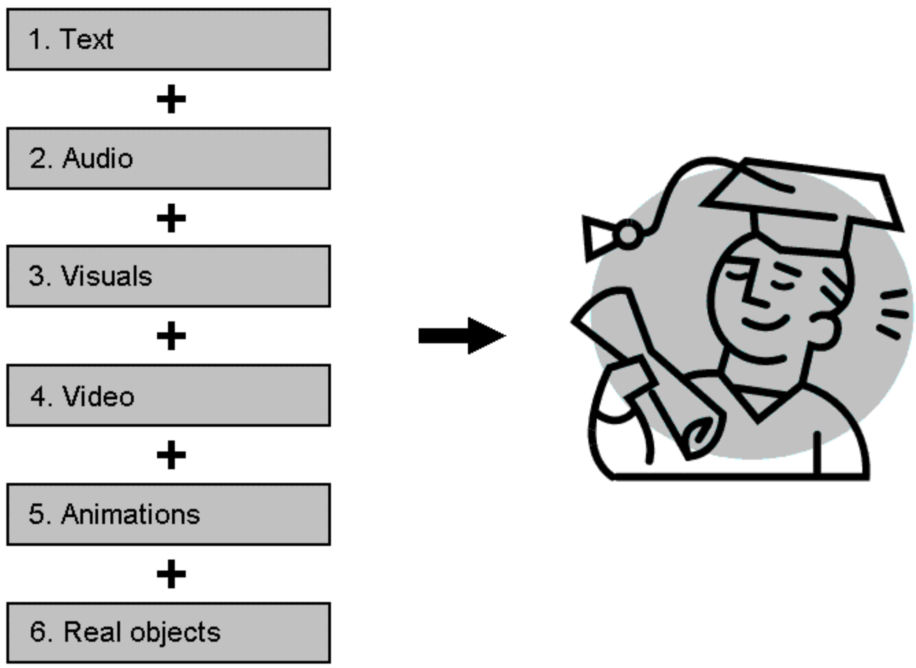
21
Media Selection

Peter Fenrich

If the Grand Canyon, one of the world's most spectacular sights, holds a viewer's interest for an average of 90 seconds then imagine how long your video clip can hold your learner's attention. – Peter Fenrich (2005)



Learning outcomes

After completing this chapter, you should be able to:

- Select the best media mix for increased learning and maximum cost-effectiveness.
- Know the different media categories: text, audio, visuals, video, animations, and real objects.
- Understand how each medium relates to learning.
- Describe how different media can affect a learner's motivation.
- Have ideas about how to keep the message clear.

Introduction

A major part of instructional design is selecting the appropriate media mix to effectively teach the learning outcome(s). Selecting the best media mix increases learning and maximizes cost-effectiveness. Some concepts are extremely difficult to teach without the correct media mix.

This chapter introduces you to the different media categories: text, audio, visuals, video, animations, and real objects. The chapter explains how each medium relates to learning and describes how media can affect a learner's motivation. The strengths and weaknesses of each medium are presented with respect to the different learning outcome classifications, as previously discussed in Chapter 10, General Principles of Instructional Design. This chapter also provides ideas on how to keep the message clear.

Media categories

The media categories you can include in an online course are:

- text
  - Text is typically presented on computer screens but the resources you provide can also include print-based materials.
- audio
  - Audio can be heard from DVD-ROM/CD-ROM disks, computer hard drives, an intranet, and the Internet. However, an online course can also include resources like tapes (audiocassettes), radio, television, and live commentary.
- visuals
  - Visuals can be stored on DVD-ROM/CD-ROM disks, computer hard drives, an intranet, and the Internet. Other resources can include slides, photographs, overhead transparencies, and paper-based material.
- video
  - Video can be retrieved from DVD-ROM/CD-ROM disks, computer hard drives, an intranet, and the Internet. Other sources can include mini-DV tapes, film, and VHS tapes.
- animations
  - Animations can be stored on DVD-ROM/CD-ROM disks, computer hard drives, an intranet, and the Internet. Film, VHS tapes and other sources can also contain animation resources.
- real objects
  - Real objects include actual equipment and models.

Note that:

- Video typically includes natural images recorded with video equipment, whereas animations are usually created artificially with computers and/or other tools.
- Video materials often include an audio component.
- There are major differences between video and film. This chapter uses the terms film and video synonymously.

Media and learning

The media you select do **not** determine whether learning will occur. The media simply carry your message to the learner. However, the media you use can influence the amount of learning that occurs. If you combine the media's strengths with instructional methods that take advantage of these strengths, you can positively influence learning.

Complete instructional packages can, but should not necessarily, include all of the different media. Note that:

- Learning from course content that includes more than one medium is usually more effective than content using only one medium. This is partly because different parts of the brain process different information. For example, some parts of the brain process text, while others process visuals. When instructional materials activate more regions of the brain, there are increases in learning and retention compared to materials that require fewer parts of the brain to process information.

Practical Guideline
Teaching with more than one medium is usually more effective than teaching with only one medium.

- In many situations, you can and should use more than one medium to teach the skill. You will need to determine the media that will complement the intended instructional strategy.
- If you use too many media at one time, you can impede learning.
  – Although multi-sensory learning experiences tend to be effective, learners can only process a limited amount of information at one time. Imagine trying to read text while a supporting animation is being shown on the screen.
  – Media should support and enhance each other.
- Base your media mix decision on what is being taught, how it is being taught, how it will be tested, and the characteristics of your target audience.
  – Different media may be needed for different learning outcomes. For example, video may be appropriate for the attitude component but may not provide the corrective feedback necessary for the intellectual skills component.
  – Do **not** select media simply to dazzle or for convenience.

Media and motivation

Consider a student's experience with each medium. For example, if the students have typically struggled in text-based programs, then consider using other media. Students must have expectations of success with the selected media and have the skills to extract information and learn from the media. This is **not** always a safe assumption. For example, many learners are used to watching video passively and do not know how to focus their learning or take effective notes while watching video.

Depending on a student's learning preferences or learning style, the media you choose could be liked or disliked. If the selected media are **not** preferred, enhance motivation through:

- explaining how lthe material will fulfill the student's needs;
- illustrating how the material is important; and
- reminding students that the test will be based on the material.

Text

You can use text to teach many skills (most verbal information and intellectual skills, and some psychomotor skills and attitudes) unless the target audience has a poor reading ability or low motivation. However, text alone cannot adequately represent the richness of the world and, for instructional effectiveness, you will often need to combine text with other media.

Practical Guideline
Remember that students may later want to refer to notes. Ideally, they should be able to print content and summaries.

Text is better than video and audio when the topic is complex (e.g., forecasting economic trends), abstract (e.g., balancing chemical equations), or has structure (e.g., solving word problems). Text is especially effective for verbal skills such as describing, listing, and naming. With proficient readers, verbal information can usually be learned faster with text than with other media. For higher-level skills, remember that practice and feedback are particularly critical. Text is often a major component of effective practice and feedback.

GUIDELINES FOR CREATING TEXT

Text often forms the foundation of online courses. For your course to be effective, the text has to be written well. Use the following guidelines for creating effective text:

- Make text understandable.
- Minimize reading.
- Develop a good writing style.
- Follow the basic rules of writing.

As with many generalizations, there are exceptions to the following guidelines. For example, a writing or communications course where rich prose is encouraged should not be done as suggested below.

Make text understandable

It is particularly important for you to make text understandable when students are learning at a distance. Make text understandable by ensuring there is message clarity, keeping wording to a minimum, and keeping sentences and paragraphs short. Most subject-matter experts need support in writing materials in this way. Consider using a professional writer if it is not too expensive.

Keep the text clear and concise. Message clarity is critical for effective and efficient learning. Simple words help ensure that the message remains clear. Use simple words such as "pay" rather than "compensation" or "begin" instead of "initiate". Do **not** try to impress with a difficult vocabulary as this can lead to failure. Similarly, unnecessary and complex jargon can also cause comprehension problems. Also, keep sentences short. As a rule, as sentence length increases, comprehension decreases.

Practical Guideline
Text should be short, clear, concise, and simple.

Keep paragraphs short enough to break up large chunks of information into manageable pieces. This is also useful for enabling the material to fit onto computer screens. Short paragraphs also help learners who are choosing to skim the material. Short paragraphs also increase the amount of white space.

Minimize reading

It is important for you to minimize reading since it is generally more tiring and time-consuming to read from computer screens than printed material. People tend to read printed material 20 to 30 percent faster than the same content on a computer screen. Minimizing reading also helps students with weak reading abilities and those with disabilities. Minimizing reading makes writing for computer screens fundamentally different from writing for printed materials. Be sure that you have this skill or that it is available on the team.

There are a number of ways you can minimize reading:

- Use simple and clear wording.
  - Students with better reading abilities usually do not find simple clear writing offending. They simply read it faster.
  - Highlight key words. This makes important information easy to find.
- Ensure smoothness.
  - Read the text aloud to hear if it flows smoothly.
- Be consistent.
  - Keep screens predictable and regular to minimize searching. There should be a clear underlying structure. Facilitate this with organizational landmarks such as headings.
  - Use a standardized and consistent "template" to format your pages.
- Use tables to organize information.
  - This makes the information easy to find and understand.
- Use lists instead of paragraphs.
  - This makes the information easy to find and understand.
  - List items should follow the same grammatical structure.
  - Highlight lists with bullets or dashes.
  - Make lists clear by creating logical groupings.
- Use flow charts and diagrams where possible to illustrate your points.

Develop a good writing style

Your writing style should follow these guidelines:

- Use active verbs, and eliminate unnecessary words.
  - For example, write "Your software choice will affect your efficiency" rather than "Your efficiency will be impacted by your choice of software". Similarly, write "text colour", not "colour of the text".
- Keep your writing natural and conversational. Address your reader directly by using the second-person voice (e.g., "you").
  - Vary sentence lengths. Note that this page has a variety of sentence lengths.
  - Begin sentences in a number of different ways.
  - Use effective connecting techniques. For example, start succeeding sentences with "However" or "Similarly" or include key words of the preceding sentence.
  - Use many common one or two syllable words.
  - Include colloquial and idiomatic expressions (but be sure the audience will understand them).
  - Use a minimal amount of abbreviations, proper nouns, and numerals.
- Use the second person (i.e., you rather than we).
- Be unbiased.
  - Eliminate sexist, stereotypic, ethnic, and lifestyle comments (see Chapter 4, Addressing Diversity).

Follow the basic rules of writing

You need to follow the many rules of effective writing. Some of these rules include:

- Use correct writing mechanics (e.g., spelling, grammar, and punctuation).
  - Errors affect credibility, lead students to take the material less seriously, and can teach poor writing habits.
  - Use a spell-check program but remember that spell-checkers might not consider sentence context and meaning.
- Avoid hyphenating words at the end of lines.
  - Hyphenated text is harder to read.
- Define all acronyms on first usage.
  - For the first instance, write the full term and then put the initialism in brackets. For example, write Computer-based Training (CBT). Repeat the full term if it has not been used for several pages.
- Minimize punctuation. For example, in acronyms use CBT not C.B.T.
- Use upper and lower case letters.

  - Sentences written in upper case letters take longer to read. Reading speed increases when learners can recognize word shapes.
  - Most students find that text written only with capital letters is hard and somewhat uncomfortable to read.
  - THINK ABOUT WHAT IT FEELS LIKE TO READ THIS SENTENCE. Does it bother you? Compare it to other sentences. Imagine a whole page written in capital letters.
- Only use symbols **every reader** understands (e.g., $ for dollar).

SPACING

The spacing you use can greatly affect the "look and feel" of your product. As a guideline:

- Use lots of white space.
  - Crowding reduces readability and can make a screen "feel" unpleasant. If in doubt, use more screens and less text per screen but try to keep complete "thoughts" on one screen. Remember that on computers, extra screens are essentially "free".
  - Since screens should only contain a limited amount of text, take special care to make smooth transitions between related screens.
  - It is easy to find and focus on text that is isolated by white space. Note that white space can be overdone. If there is too much white space (i.e., too little text on each screen) then the learner will spend too much time moving from screen to screen. As a guideline, squint at the screen. Determine whether you focus on the message or the space.
  - Single line spacing can work well but separate paragraphs with a blank line.
- Keep the top and left margins for text locations constant.
  - This reduces searching time.

People read English from left to right and top to bottom. Since people tend to focus on a curved path along the screen, you should try to place key points along the curve. The best location for a key point, such as a formula, is the screen's upper left area. Poor areas for key points are the screen's top right and bottom left. Place non-critical or unimportant information in the top right and bottom left. These areas are illustrated in Figure 21.1.

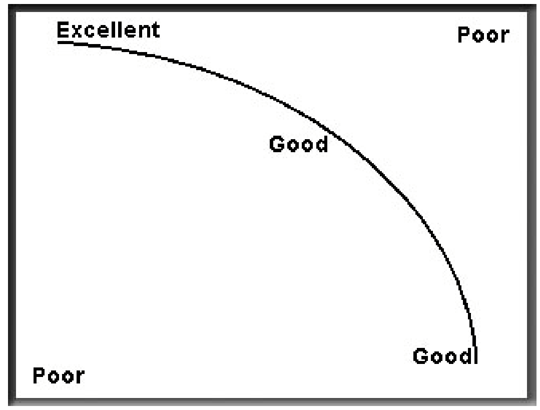


Figure 21.1. Screen focus points guidelines

There are cases where this curve cannot be used. For example, this can happen if a visual occupies the top half of the screen and supporting text fills the bottom half.

JUSTIFICATION

For the best readability, you should left justify paragraphs. Some materials are written with full justification in order to keep the right margin neatly aligned. Full justification is where spaces are added between words so that the text starts on the left margin and ends at the right margin. In general, you should avoid full justification. Full justification is harder to read than left-justified text. With full justification, a reader's eyes move more because of the large spacing between words.

Practical Guideline
Left justify text.

Centre-justified paragraphs are also hard to read. Right-justified paragraphs are mainly useful for aligning numbers. The various types of justification are shown in Figure 21.2.

FONTS

Most systems have an adequate selection of fonts. It is safest for you to use standard system fonts like 'Arial' that are available on every machine running Windows. If you use an uncommon font then the user's computer could substitute a font that may not be appropriate. If you do not use a system font, determine whether there is copyright clearance for distributing the font with the software. A fee or royalty may need to be paid in order to distribute the font. If there is any doubt, use the system fonts. It can be time-consuming but you could create a unique font if the supplied fonts do not meet your needs.

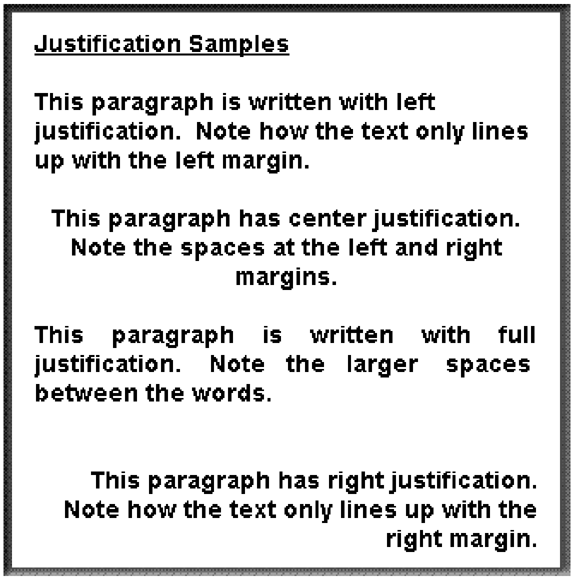


Figure 21.2. Variations of justification

Choose a font that is clear and easily readable such as Arial, Helvetica, or Times New Roman. Although some people may call these fonts “boring” or “unattractive”, readability is critical for online applications — especially when students will read text for longer time periods. Italic, serif, sans serif (non-serif), script, decorative, and small fonts (see Figure 21.3) can be hard to read depending on their size and the monitor’s clarity. Some people prefer serif over sans serif fonts since the “feet” of serif fonts helps the eye move horizontally. People tend to read faster with serif fonts than with sans serif fonts. Regardless of what font you use, it is impossible to please everybody.

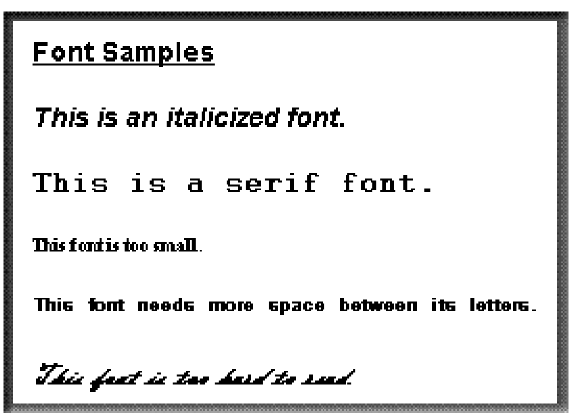


Figure 21.3. Variations of fonts

Be sure that you keep the font constant. If a second font must be used, choose one that appears similar to the first. Too many fonts can be distracting, confuse the learner, and reduce the reading speed. This sentence with only three different fonts proves the point.

Practical Guideline
Use an easy-to-read system font and keep the font constant.

You can use font sizes to organize information, such as in headings, and to indicate importance. Headings should be in upper and lower case letters as uppercase text is less legible. Headings can also help learners quickly find pertinent information, especially when the headings make sense on their own. You can use a slighter smaller font size for labels.

Use larger font sizes for children and seniors. For other audiences, the font size used should not allow for more than 60 characters on a 6-inch (15 cm) line. This helps increase readability, decrease fatigue, and maintain a student’s patience and attention. As a proportional guideline, use a 14-point bold Arial font for the main text given an 800 by 600 screen size. This is only a starting guideline since readability is affected by the screen size and font used. If there is any doubt, ask typical learners for their opinion.

VARIABLE SPACING

Variable spacing (see Figure 21.4) reduces the space between letters. This is especially noticed with the letters “i” and “l”. Variable spacing allows you more characters per line but is not as “neat” as fixed spacing (see figure 21.4) where all letters use the same amount of horizontal space and consequently line up vertically.

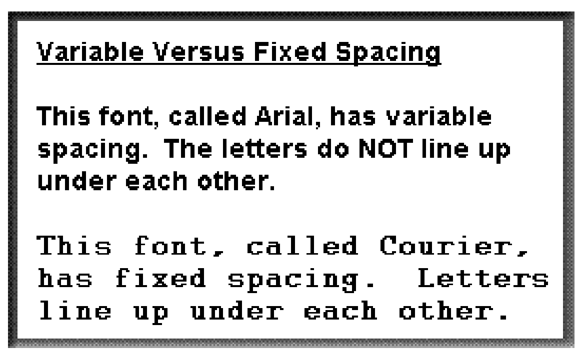


Figure 21.4. Variable versus fixed spacing

For practical reasons, such as screen size limitations and a faster reading speed, you should use fonts that have variable spacing, such as Arial. Note that if the letter spacing is too tight, the letters can be hard to distinguish from each other. Spacing that is too wide can prevent learners from grouping letters into meaningful forms and consequently decrease reading speed.

Practical Guideline
Use fonts that have variable spacing.

SCROLLING

Scrolling adds new text lines to the bottom of the display while the top lines disappear. User-controlled scrolling text boxes are time-consuming and cumbersome for students to use. Many readers find scrolling frustrating. Where appropriate and possible, do **not** force students to scroll text in order to read all of the material. Rather than using scrolling, you should use more screens to show the text or allow learners to click on buttons to instantly see previous or subsequent information. Another reason to avoid scrolling is that some viewers only read to the point where scrolling is required.

HYPERTEXT AND HYPERMEDIA

Hypertext is text that is linked to other information. Hypertext allows learners to quickly get more information by activating, such as by clicking a mouse over highlighted parts of the screen. Highlighted active words are sometimes called "Hot words". Hypermedia goes beyond hypertext by providing access to a variety of media. Since links often lead to other links, the links are like a three-dimensional web.

Hypertext and hypermedia are useful for Internet-based research projects in that they allow learners to access information in which they are interested, pursue unique ideas, and learn in unplanned ways. Hypertext and hypermedia can also be used for simple information retrieval such as searching an encyclopedia, creative writing projects including a hyper-novel or hyper-report, and specialized reference materials like automobile repair procedures that require a variety of media.

In general, hypertext and hypermedia applications simply provide access to information rather than teaching specified learning outcomes. There are a number of reasons why hypertext and hypermedia can be weak from an instructional perspective. Students may **not**:

- learn effectively if there is no interaction that requires them to think about the material
- be able to differentiate between accurate and inaccurate information (both of which are found on the Internet)
- know how to find needed information if it is not obviously presented
- choose important linked information
- understand the logic or links used to organize the material
- have the spatial visualization ability needed to effectively navigate through the content
- be capable of choosing their own paths to acquire specific knowledge
- have the cognitive capacity to deal with the content, especially if there is poor screen design
  - If the learner thinks too much about too many fonts and font sizes, objects, navigation aids, and screen layouts, the learner may not be able to mentally process the content.
- see important information
  - Learners are more likely to miss information if scrolling is needed to find the information or if the information is "deeper" than they searched.
- prevent themselves from getting lost
- prevent themselves from accessing more information than they can mentally process
- spend much time on the content, as learners tend to skim material that they find on the Internet rather than reflect on the material

Practical Guideline
Do not assume that a hypertext or hypermedia application will result in effective learning.

In other words, for learning to occur in hypertext and hypermedia environments, learning should be specifically planned and guided. Follow the principles of instructional design.

Audio

You can use audio for obvious things like music, poetry, and sound effects and, more importantly, when real sounds, such as heart, animal, and normal and defective equipment sounds, are an integral part of the learning outcome. You can use audio to effectively teach many skills such as attitudes, especially if you personalize the material. Audio is also effective for teaching intellectual skills such as learning languages. You can also use audio to gain attention, give feedback, give directions, personalize computers, provide realism such as through presenting actual speeches, make annotations, teach the pronunciation of new words, provide multilingual support, accommodate non-readers, and provide meaning for images.

Many instructors record their face-to-face lectures and make them available online. A recorded version of a lecture has limitations, if only because the recorded version does not allow the listener/viewer to ask questions. A compounding problem is that many lectures are delivered poorly (i.e., students are passive recipients of information). It can be argued that recorded lectures benefit those who cannot attend or want to review key points. However, some students will choose to not to attend lectures when a recording is available. It is debatable whether recorded lectures do more harm than good. [Author's note: My personal view is that recorded lectures should only be used if it is the only option, such as it being the only way to hear a renowned speaker. Typical non-interactive lectures have been proven to be one of the worst ways to deliver content. A streamed lecture of this type can only be worse.]

Audio is more effective when the topic is simple, concrete, and has little structure, as can be the case with foreign language vocabulary. However, you can effectively teach many skills with audio, such as intellectual, psychomotor, and attitudes, when the audio is supplemented with other media such as text, especially when providing practice and feedback. You should also supplement audio with effective preparatory and follow-up activities. An advantage of audio over text is that listening is much easier than reading.

Practical Guideline
Audio can be particularly effective when combined with other media.

You can use audio effectively for students who are visually impaired and those with poor reading abilities. For those with poor reading abilities, one solution is to provide text but let students click on an audio button whenever they want to hear a narration of the text. One strategy is to display text and simultaneously play a matching narration. Although this strategy is useful for some students, many learners find this annoying. Audio can be problematic when played at a different speed than the student is able to read. For example, if the audio is played at a slower speed than the learner's reading speed, as is true in most cases, the learner can be frustrated as they continually wait for the audio while they read. If the audio is played at a faster rate than the learner can mentally process the information, learning can be compromised. Alternatively, they may try to ignore the audio—which is not easy to do. Note that it is unlikely that all students in a target audience will have similar reading speeds.

To help learning and facilitate reviewing, let students have control over the audio. For example, many students may want to repeat audio clips. This can be easily done in online applications.

For audio to be effective for learning, you need to ensure that the students pay attention, as with all media. If a student is not listening, audio becomes a part of the environment. Keep students involved by posing questions that make students think and keeping the audio clips short. This is critical since aural memory is **not** particularly retentive. You can aid a student's aural memory by enabling them to control the audio, such as repeating it as needed. Students must also be able to understand the audio. Consider developing parallel audio versions in other languages.

Practical Guideline
Design audio to keep the students attentive.

For online courses, speech and sounds can be used to enhance learning.

SPEECH

You can use speech in the form of a narration or dialogue to teach effectively. To enhance what is directly said, you can also convey meaning through:

- emphasis
  - You can add emphasis through stressing a word.
- inflection
  - Add inflection by altering the pitch or tone, such as raising the pitch at the end of a sentence to indicate a question.
- aural mood
  - Establish aural mood through choosing specific words such as crashed versus hit or fantastic versus good.

To avoid confusion when using narration with text, ensure that the audio exactly matches the text. However, matching the audio to the text can be problematic since changes or edits are common. Since it can be difficult to change the audio, record the audio **after** the narration has been thoroughly evaluated.

Practical Guideline
Record narration after the narration text is finalized.

Although using professionals will increase those specific budget items, consider hiring professional actors, narrators, and others like scriptwriters. Their quality will show through and ensure that the audio is effective. After reading the script and context, professionals tend to be able to quickly understand the overall approach and deliver the appropriate style at the right pace. Also, they will complete the recordings in less time than amateurs will need through requiring fewer retakes. They do this by quickly making modifications after you give them feedback.

When you select actors and narrators, ensure that they are credible and appropriate for the audience. For example, be sure that the audience will identify with them. Peers or respected professionals are often good choices. Actors and narrators need to have an appropriate accent, sound the right age, and be of the appropriate sex (if it makes a difference). As a rule, male voices tend to be more authoritative and credible while female voices tend to be friendlier. Note that two or more voices can add variety and thus increase interest and attention.

SOUNDS

Sounds can be very effective and even necessary to teach certain skills. For example, these include fixing equipment when a sound indicates a specific malfunction as well as diagnosing medical problems such as lung diseases.

Practical Guideline
Sound will not save a weak presentation!

You can use sound effects to:

- add realism
- generate emotions
- define space (e.g., distance and direction)
- establish a locale or create an environment (e.g., crashing waves for a beach scene)
- emphasize an action (e.g., screeching tires indicate hurrying)
- intensify an action (e.g., time length or loudness of the emphasis action)
- depict an identity (e.g., slurred speech for a drunk)
- set the pace (e.g., roar of an engine)
- provide a counterpoint (e.g., using unexpected sounds as is done in comedies)
- symbolize meaning (e.g., church bells symbolizing a funeral or wedding)
- unify transitions (e.g., providing continuity between scenes)

Base your sound design on sounds heard in the real world. Sound effects that do not sound right can be distracting.

To decide whether you really need sounds, take the sounds out. If the audience still understands the messages, you probably do not need the sounds.

Note that you should adjust the sound's volume to suit the content. For example, do **not** let sounds overpower a narrator. Also, do **not** use sounds repetitiously. Students sometimes enjoy sounds the first time they hear it but with repetition the sound can become obnoxious.

Music can be used to achieve the same purposes as sound effects. You can also use music to set and change moods, feelings, and atmosphere. You can add music to slide shows and other applications to provide ambience for the viewer. You may want to add music to an opening screen or a menu.

Visuals

Visuals can be considered to be "real" as in photographs and slides. Visuals can also be pictorial or diagrammatical representations of "real" objects.

For instructional purposes, you can use visuals to illustrate objects and ideas, identify objects, show relationships between objects and ideas, classify objects, show spatial relationships, teach psychomotor skills that do **not** need to be recognized or copied, and help teach attitudes. You can also use visuals to make abstract concepts concrete. For example, you can do this by graphically showing the relationship between interest rates and the time required to pay off a mortgage. When you design online lessons follow the old adage, "A picture is worth a thousand words." You should consider combining visuals with text to provide practice and feedback, as text alone does not suffice in many cases. If you teach with visuals, you should likely include visuals in practice and feedback as well as testing.

Note that some learners have difficulty learning from abstract sources such as text, numbers, and symbols. Visuals are an alternative that can help these learners. Similarly, you can help these learners by presenting data with graphs and charts.

Compared to only using text, visuals combined with text reduce the learning time and help students acquire and retain information. Visuals provide an alternate learning path since certain parts of the brain process visuals while different parts process text.

Practical Guideline
In general, adding visuals leads to increased learning.

Visuals are particularly valuable when you direct learners to focus their attention on specific details, which you can do through concise prompts or captions. A combination of text and visuals can result in a 15 to 50 percent increase in recall over either alone. Recall is increased for both simple skills, such as recalling facts, and complex skills, like performing operations. Lessons with visuals result in higher retention over long time periods (i.e., months). Visuals particularly benefit weak learners. Also, they can be mentally processed much faster than text. Students may be better able to transfer the skills learned to other situations.

In general, visuals can be valuable learning tools. Some ideas cannot be adequately expressed in words but can be readily depicted with visuals. How could you adequately describe the surface of Venus or the structure of DNA without a visual? Look at Figure 21.5. Think about the words you would use to describe what this rhinoceros looks like. If the learner has not seen one before, with those words and without seeing a visual, could learners accurately envision the rhinoceros? For online applications, visuals can be particularly effective if students can control the length of time the visual remains on the screen, in other words proceed when they are ready.

Figure 21.5. Hard to describe visual

Note that in some cases, a visual drawn by an artist may be more effective than a real image. Some learners may not be able to focus on all of the details that real images sometimes provide. In a related way, people will usually recognize a cartoonist's sketch of a hand as being a hand faster than a digitized image of a hand, even if a cartoonist's sketch of a hand has three fingers. Simultaneously look at Figures 21.6 and 21.7. Which do you more quickly recognize as a hand? Since complex visuals require more time to mentally process than simple images, provide simple images (where appropriate).

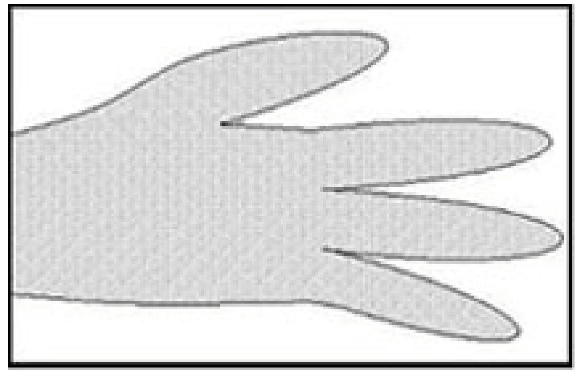


Figure 21.6. Cartoon hand

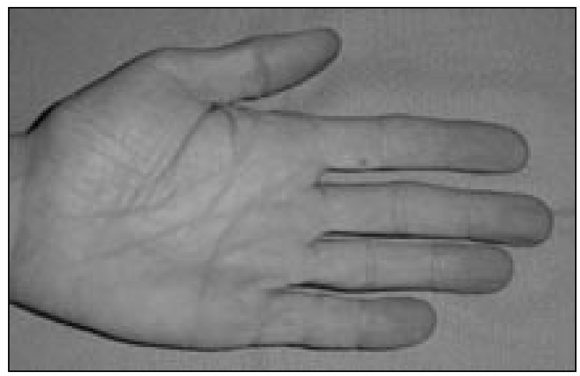


Figure 21.7. Digitized hand

On screens with text and visuals, learners are naturally drawn to the visuals. As a minimum, your visuals will add variety to screens. Although irrelevant visuals do not help students learn relevant content, some images (e.g., humorous) can help "lighten" the material. Screen variety can increase attention and motivation and consequently indirectly affect learning positively.

KEEPING THE MESSAGE OF YOUR VISUAL CLEAR

To keep the message clear, your visuals should be self-explanatory, have labels, and only include relevant information!

Visuals should be self-explanatory

Self-explanatory visuals illustrate the message. If the image is not self-explanatory then you should determine how it could be done. At times, this goal may not be possible but you should at least aim for it. However, be sure to provide an explanation to link the visual to the idea you are conveying.

Practical Guideline
As a rule, ensure your visuals are self-explanatory.

You should use the following methods to ensure message clarity:

- Keep the visual simple and only include essential information. For example, crop images to eliminate unnecessary details. Complex visuals can weaken the instruction by confusing or distracting the students.
- Match the visual's complexity to the learner's skill. Overly complex visuals are often ignored.
- Consider using simple diagrams instead of realistic images. Realistic images sometimes contain so much detail that the learner is distracted from understanding the message.
- Use a series of diagrams rather than a single complicated diagram. When explaining a process, use one visual per step. One technique you can use is to gradually build the visual from screen to screen.
- Add labels to diagrams to highlight key points. Horizontal labels are the easiest to read.

Only include information relevant to the visual

If you include extra information, you could clutter the visual and can cause confusion. On screens that build, some of the previous information may need to be erased or de-highlighted so that new key points are easily found. Build the visuals in logical straightforward sequential steps. Plan to allow the learner the capability to reverse the steps for easy review.

Video

With respect to teaching, you can use video, which is usually combined with audio, effectively for:

- demonstrating procedures, changes, and processes
  - Learning can be especially effective when the learner can control the video with features, including playing when ready or replaying as needed.
- teaching attitudes and values
  - Emotional material and/or real-life examples can be shown.
  - Text may be needed to help explain the attitudes and values.
- making abstract concepts concrete
- classifying and comparing information
  - For classifying and comparing information, video is particularly valuable when the information can be quickly accessed.

Video can also be useful for:

- gaining and holding attention as well as motivating learners
  - This can be done through special effects, colour, motion, audio, and historical clips.
  - This can lead to increased retention and recall of information.
- introducing topics or procedures
  - This can be easy and pleasant for students especially when the alternative is lengthy text.
- presenting visually rich material that would otherwise be hard to explain (e.g., chemistry and physics experiments, how an amoeba moves, heart valves opening and closing, and human interactions)
  - Information that needs to be visual or have realism can be presented. Examples of these include the courtship rituals of animals and human behaviours for changing attitudes.
  - Audio, such as lung and heart sounds, can also be presented.
- testing
  - Testing with video can be much more realistic than testing via text.

Practical Guideline
Use video to teach skills that are difficult to explain with other media.

The strengths of video are more evident if you tell the students what they are going to learn and what they should focus upon before they view the video. A video's effectiveness also relates to how well the material attracts and directs the learner's attention. Learners tend to have a short attention span for video. If the Grand Canyon, one of the world's most spectacular sights, holds a viewer's interest for an average of 90 seconds then imagine how long your video clip can hold your learner's attention. You can minimize this problem by presenting short clips, as short sequences are helpful in maintaining student attention and interest. This also helps keep the message focused on the learning outcome being taught.

Practical Guideline
Prepare students before they watch a video. Let them know where to focus their attention.

There can be problems with video. Most students remember generalities rather than details. Also, video sometimes provides information at a fast rate. So, you should likely plan activities to help learners retain the material and also keep the video available to students for studying. In some situations, you should let the learners control the video (e.g., slow forward, step forward, step backward, slow backward). This is particularly helpful for reviewing psychomotor skills such as studying procedures and noting detailed information.

VIDEO COMBINED WITH OTHER MEDIA

If you combine video with audio, you can effectively teach attitudes and provide elaborations. Note that video combined with audio requires more mental processing than either alone. Consequently, you can overwhelm students with more information than they can mentally process. One solution is to put pauses after complex elements to allow learners to mentally "catch-up" before you present new material.

Video combined with audio can depict events faster than can be done with only text. However, students perceive video as being easier than text and tend to spend less effort in learning from video than text. Consequently, students may learn less from video than from comparable text. You can enhance learning with video by cuing the learner, providing interaction, and keeping the video clips short.

Since video tends to be weak at teaching detailed information, provide video control and text-based summaries to help with this problem. Consider combining video with text to provide practice and feedback.

Practical Guideline
Video has many effective uses but is weak at providing detailed information.

DIFFICULTIES WITH PROFESSIONAL QUALITY VIDEO

Professional quality video usually requires a large amount of storage space when digitized and significant costs, time, and expertise to develop.

Digitized video (for both professional and non-professional productions) requires a large amount of storage space. Expect to make some compromises.

- Modern video cameras automatically digitize video. However, if you are working with old sources, you may need to convert analog (smooth and continuous) signals into a finite amount (depending on the sampling rate or number of measurements taken) of digital or binary information (1s and 0s) that computers store and process. The large amount of storage space needed for digital video can be a significant problem, especially for CD-ROM distribution, unless compression techniques are used.
- Minimize digital storage requirements by using short clips and only use the amount of video that is necessary. Some video clips, such as interviews, may not require full-motion, full-screen, or full-colour presentations. Although video is typically shown at a frame rate of 30 frames or images per second, as a rule, action sequences should play at a minimum of 20 frames per second while you can reduce non-action clips (e.g., "talking heads") to 10 frames per second if you need to save disc space or reduce bandwidth requirements. Screen sizes for video generally range from 640 × 480 down to very small sizes, depending on the computer system and/or speed of the Internet connection.
- Depending on the computer's speed, computer's memory size, and the file size, there may be a significant delay while large video files are loaded. Short video clips are often preferable.

Practical Guideline
Estimate the amount of data your final product will need to hold to ensure that your data will fit on the selected storage medium.

Producing professional quality video particularly needs justification since you will incur significant costs for their production:

- Justification can be from the motion needing to be taught being unfamiliar or difficult to perform.
- Justification can arise from concepts being easily and best understood with video.
- Justification is easier if the material will be useful for a long time. This is particularly important with video since it can be expensive to update the video. Filming and editing can have significant costs.
- Typical costs per day for a camera operator, other personnel such as a sound person and actors, a quality camera, and other equipment such as lights tend to be expensive, especially when paying for talented individuals.

Projects requiring professional video can take a large amount of time to produce. For example, a relatively simple project, such as creating a resource that covers each step of disassembling and assembling an aircraft engine, can require 200 hours of development time. Many projects need specific expertise such as media specialists and instructional designers who specialize in multimedia applications.

Professional productions also require relatively expensive filming equipment.

- Although consumer-level digital video equipment tends to be affordable, professional-level equipment can be costly.
- Better filming equipment has high sensitivity (this is a measure of the minimum amount of light to make a usable picture—measured in units of lux), high resolution (this determines the picture's sharpness), and dynamic response (this is the ability to detect rapid changes in a scene's light intensity).

Practical Guideline
High-quality video takes time and expertise to develop.

GATHERING EXISTING MATERIALS

Before you go to the effort of recording any video, determine whether any suitable materials exist. Gathering existing materials can save you significant time and money if you do not have to "re-invent the wheel". For any materials you can get, be sure to:

- get copyright clearance **in writing**
- get original materials
  - Each succeeding generation has poorer quality.
- get materials in the format you will use, such as mini DV tapes
  - If you transfer material from one format to another, some image quality will be lost. It also costs time and money to transfer material between formats.
  - Existing materials are often found in a variety of formats (e.g., HD, mini DV, film, one inch, 3/4 inch, Betacam SP, 16 mm, Hi8, 8mm, S-VHS, and VHS).
- determine whether the material's quality is acceptable
  - Sometimes poor quality is better than students never seeing the material.

Practical Guideline
Using existing materials can save you time and money.

Note that many high-quality generic clips are available for a fee in a variety of formats. If it is important to you, ensure that you can distribute the clips royalty-free.

You may have problems in gathering existing materials, in that:

- copyright clearance may cost money
  - Costs can range from being expensive to free.
- it may not be possible to locate the copyright owner
- the materials may not arrive or it could take a long time to receive the materials
  - Sending materials can be a low priority of copyright owners.
- copyright clearance may not be granted for some needed materials
- some materials may not be exactly as you need
  - For example, video materials designed to be played linearly, such as in movies, often have audio that overlaps scenes in that the audio may start before or end after the specific video is seen. Also, the video is usually not designed to be shown in a series of short clips, as can be preferred in online courses.

Animations

Animation is another medium that you can incorporate into your online courses. It is important for you to consider using animations as a part of the instructional strategy since animations can significantly enhance learning, motivation, and attitudes as well as reduce the time needed for learning.

Animation means "to give life to" something. Animations, which are a series of visuals that change over time, are like video sequences except that animations are created with a computer, other tools, or manually rather than by filming real objects in motion. For this reason, a video can be easier to make than an animation.

You can effectively use animations for:

- showing relationships between objects and ideas
  - For example, animations can illustrate pressure changes in a pressure regulation system or how mechanical systems work.
- simulating the results of actions
  - As an example, animations can show the effects of drug dosage on heart rates.
- showing sequential steps in a procedural task
  - For example, animations can be used to explain how to adjust a camera.
- explaining difficult concepts
  - As an example, you can use animations to illustrate how the body responds to changes in oxygen demand.
- making abstract concepts concrete
  - For example, animations can show how electrons move in orbits around the nucleus of atoms or how information flows in an electronic system.
  - This is important since some learners have difficulty learning from abstract sources such as text, numbers, and symbols.

With respect to learning, you can use animations to:

- enhance performance and retention
  - Note that learning generally requires cues and guidance to specifically direct a student's attention to the pertinent point. This is particularly important for younger and immature students.
  - Ensure that students are not presented with more information than they can handle.
  - In general, animations with text are more effective than visuals with text. This is especially true when the concept involves directional characteristics or changes over time. In these situations, animations can help simplify an abstract idea into a concrete idea.
- reduce the time needed for learning
- gain attention and improve student attitudes
  - This is partly due to animations simply adding variety to the presented content.

KEEPING THE MESSAGE OF YOUR ANIMATION CLEAR

To keep the message clear, your animations:

- should be self-explanatory, as a guideline
  - Students do **not** necessarily know how to interpret animations. The ease of interpretation can depend on their age and maturity. Evaluate your animations with target audience students.
  - You can help make the animation clear by providing supporting text and/or labels. Alternatively, focus the student's thoughts on the pertinent information.
  - If it is not self-explanatory, consider redesigning the animation.
- must match the learning outcomes
  - Some animations have been used to impress rather than teach.
- should be set up to allow learners to control when they see the animation
  - Students should be able to repeat animations since it is easy to miss significant points during minor distractions.

Practical Guideline
Self-explanatory animations illustrate the message.

DISPLAYING ANIMATIONS

You should only display animations when the learner is ready to view them. Students can do this by clicking an "Animate" button when they are ready. Before showing the animation, provide guidance to ensure that the students will focus on the important point!

Practical Guideline
Animations should only begin when the learner is ready to view them.

Your animation will appear more realistic if the object's speed, size, and relative motion are accurate. Base the animation's speed on real time rather than the computer's speed. Otherwise, due to a wide variation in computer speeds, animations may run at different speeds on different hardware configurations.

You can make animations appear three-dimensional.

- Use 3D for realistic effects.
- 3D animations can be more powerful than 2D animations, especially if the learner can view the animation from different perspectives such as front, side, and top views. For example, this can be useful for training students to repair equipment.

Real objects

Imagine learning how to create an online course without ever using a computer or seeing real examples or learning how to juggle without touching any real objects.

Real objects are excellent when teaching psychomotor skills and when the skill must be practised and mastered. There is no guarantee that the skill learned on a simulator or other format will be transferred to the work place. So, remember the old saying, "Practice makes perfect".

For some training needs, such as those taught through simulations, you will also need to provide for real experience. A truism illustrates this: "There is only so much you can learn about skydiving while standing on the ground." At certain points within or after the online learning activities, simply direct the student to real objects (or models) or exercises.

Practical Guideline
Consider including real objects as a part of the entire online instructional package.

Selecting media

The media mix you choose must be able to meet the requirements of the instructional strategy and address all of the instructional events. In particular, the media mix must effectively teach all of the learning outcomes and should allow for practice and feedback. Use the following general guidelines for selecting the appropriate media mix for the learning domains of verbal information, intellectual skills, psychomotor skills, and attitudes. (Learning domains are discussed in more detail in Chapter 10, General Principles of Instructional Design.)

For verbal information such as knowledge and comprehension, you should use text and visuals. Remember to use the computer to provide interaction as that can be difficult or cumbersome to do with paper-based materials.

For intellectual skills such as applying skills to new examples, you can effectively use each medium depending on the skill being taught. Following the instructional design process will help you determine the best media mix.

For psychomotor skills such as those requiring muscular actions, you should use real equipment although, for practical reasons such as cost and safety, you may need to create a simulation that incorporates a variety of media. Video with audio or text support can be superb for teaching psychomotor skills. Similarly, a series of images with text can also be very effective.

Although you can use video and audio to effectively teach attitudes, for example, choosing to say “no” to drugs, your complete instructional strategy should consider other methods such as role-playing.

Remember to consider learner characteristics as discussed in Chapter 10, General Principles of Instructional Design.

Transferring material to other formats

If you simply transfer material from one storage format to another, the second’s advantages may not be exploited and the first’s limitations may be kept. For example, some analog videotapes have been transferred to CD-ROM. If the video clip is specifically designed to be played linearly, it may only be educationally sound to play the video linearly. In this case, the CD-ROM’s advantage of instant access capabilities and interaction are not being utilized. There may only be minimal value in having video contained on a CD-ROM instead of a videotape. In general, if material is designed specifically for one format, be careful about transferring it directly to another format. However, with modifications, transferring material from one format to another can be justified and effective.

Note that there is often a quality loss in the image and sound clarity when transferring materials between formats. Working with original materials can minimize losses.

Accessing media

You will need to consider whether the students should access the media data (e.g., large video files) from a DVD-ROM, a CD-ROM, an intranet, or the Internet. This is summarized in Table 21.1.

Summary

A major part of the instructional design process you need to do is select the appropriate media mix to effectively teach the learning outcome(s). Selecting the best media mix will enable you to increase learning. The different media categories are: text, audio, visuals, video, animations, and real objects.

The media you use can influence the amount of learning that occurs. If you combine the media’s strengths with instructional methods that take advantage of these strengths, you can positively influence learning. Learning from course content made with more than one medium is usually more effective than content comprised of only one medium. In many situations, you can and should use more than one medium to teach the skill. However, remember that if you use too many media at one time, you can impede learning. Base your media mix decision on the learning outcomes, how they are being taught, and how testing will be done. To be successful, students must also have the skills to extract information and learn from the media. You may also need to motivate your students to learn from the media selected.

You can effectively use text to teach many skills (most verbal information, intellectual skills, and cognitive strategies and some psychomotor skills and attitudes) unless the target audience has a poor reading ability or low motivation. You will often need to combine text with other media.

Text often forms the foundation of online courses. Write text well by making text understandable, minimizing reading, developing a good writing style, and following the basic rules of writing. In general for text, use lots of white space, left-justify text, use a font that is easy to read and has variable spacing, use font sizes to organize information, and avoid the requirement for scrolling.

Hypertext is text that is linked to other information. Hypertext allows learners to quickly get more information by activating highlighted parts of the screen. Hypertext is useful for Internet-based research projects and simple information retrieval. Remember that hypertext can be weak from an instructional perspective unless you specifically plan and guide the learning.

You can use audio when real sounds are an integral part of the learning outcome and to teach skills such as attitudes and intellectual skills. You can also use audio to gain attention, give feedback, give directions, personalize computers, provide realism, make annotations, teach the pronunciation of new words, provide multilingual support, provide meaning for images, and accommodate non-readers and learners with poor reading abilities. Remember that audio narration can be problematic when played at a different speed than the student is able to read. You can use speech in the form of a narration or dialogue, especially when done by professionals that the audience can identify with, to teach effectively.

Audio is more effective when the topic is simple, concrete, and has little structure. For many skills, audio should be supplemented with other media such as text. You should also supplement audio with effective preparatory and follow-up activities. Also, for audio to be effective for learning, you need to ensure that the students pay attention. Keep students involved through posing questions that make students think and keeping the audio clips short.

Visuals can be considered to be "real" as in photographs and slides. Visuals can also be pictorial or diagrammatical representations of "real" objects. For instructional purposes, you can use visuals to make abstract concepts concrete, illustrate objects and ideas, identify objects, show relationships between objects and ideas, classify objects, show spatial relationships, teach psychomotor skills that do **not** need to be recognized or copied, and help teach attitudes. You should consider combining visuals with text to provide practice and feedback as well as testing. Remember that visuals can help many learners.

Table 21.1. Differences between data storage and retrieval options

	DVD-ROM	**CD-ROM**	**Intranet**	**Internet**
Amount of data	Up to 4.7 gigabytes, enough for most applications	Up to 700 megabytes, enough for many applications	Limited by space on the host server. If needed, servers can be upgraded.	Limited by space on the host server. If needed, servers can be upgraded.
Learner access	Not found on old computers	Found on all but the oldest computers	Many organizations provide employees and/or students limited access to their intranet	Many learners are not connected but this number is decreasing yearly
Reliability	Very high	Very high	High but there are occasional system crashes	High but there are occasional system crashes
Bandwidth	Enough for most applications, faster than CD-ROMs	Enough for most applications, although high-quality video can push the limits	Enough for most applications although there can be problems with programs that are video intensive when there are numerous concurrent users	A high-bandwidth connection is preferred for most online courses, especially when quality video needs to be seen
Updating information	In general, this cannot be done unless combined with an intranet or Internet connection	In general, this cannot be done unless combined with an intranet or Internet connection	Can be done	Can be done
Developer costs	Copying and distribution costs	Copying and distribution costs	Need a server that can meet the demand	Need a server that can meet the demand
Student costs	One-time relatively low cost of the drive that is usually included when the computer is purchased	One-time relatively low cost of the drive. Most computers are sold with a DVD drive. DVD drives can read CD-ROM disks	Usually none	Monthly fee that can increase with the amount of bandwidth

Compared to only using text, visuals combined with text reduce the learning time and help students acquire and retain information. Visuals are particularly valuable when you direct learners to focus their attention on specific details. To keep the message clear, your visuals should be self-explanatory, have labels, and only include relevant information.

With respect to teaching, you can use video, which is usually combined with audio, effectively for demonstrating procedures, changes, and processes, depict events, teaching attitudes and values, making abstract concepts concrete, and classifying and comparing information. Video can also be useful for gaining and holding attention as well as motivating learners, introducing topics or procedures, presenting visually rich material that would otherwise be hard to explain, and testing. Since video tends to be weak at teaching detailed information, provide video control and text-based summaries to help with this problem. Consider combining video with text to provide practice and feedback.

The strengths of video are more evident if you tell the students what they are going to learn and what they should focus upon before they view the video. A video's effectiveness also relates to how well the material attracts and directs the learner's attention. Do this with short clips. Plan activities to help learners retain the material and also keep the video available to students for studying.

Remember that professional quality video usually requires a large amount of storage space when digitized and significant costs, time, and expertise to develop. Before you go to the effort of recording any video, determine whether any suitable materials exist.

Animation means "to give life to" something. Animations, which are a series of visuals that change over time, are like video sequences except that animations are created with a computer, other tools, or manually rather than by filming real objects in motion. For this reason, a video can be easier to make than an animation.

Consider using animations as a part of the instructional strategy since animations can significantly enhance learning, motivation, and attitudes as well as reduce the time needed for learning. You can effectively use animations for showing relationships between objects and ideas, simulating the results of actions, showing sequential steps in a procedural task, explaining difficult concepts, and making abstract concepts concrete. With respect to learning, you can use animations to enhance performance and retention, reduce the time needed for learning, gain attention, and improve student attitudes.

Like visuals, animations should be self-explanatory. Animations must match the learning outcomes and should be set up to allow learners to control when they see the animation. In general, animations appear more realistic if the object's speed, size, and relative motion are accurate.

Real objects are excellent when teaching psychomotor skills and when the skill must be practised and mastered. There is no guarantee that the skill learned on a simulator or other format will be transferred to the work place.

The media mix you choose must be able to meet the requirements of the instructional strategy and address all of the instructional events. In particular, the media mix must effectively teach all of the learning outcomes and should allow for practice and feedback. For verbal information, you should use text and visuals. For intellectual skills, use each medium depending on the skill being taught. For psychomotor skills, you should use real equipment although for practical reasons you may need to create a simulation that incorporates a variety of media. Video with audio or text support can be superb for teaching psychomotor skills. Similarly, a series of images with text can also be very effective. Although you can use video and audio to effectively teach attitudes, your complete instructional strategy should consider other methods such as role-playing.

If you simply transfer material, especially video, from one storage format to another, the second's advantages may not be exploited and the first's limitations may be kept.

You will need to consider whether the students should access the media data from a DVD-ROM, a CD-ROM, an intranet, or the Internet. Each has different advantages and disadvantages.

Glossary

Fixed spacing is present when the spacing between letters is constant. Fixed spacing requires more space than variable spacing.

Hot words are highlighted words that indicate active links to other material.

Hypermedia is media that is indexed and linked in a logical manner to other information.

Hypertext is text that is indexed and linked in a logical manner to other information.

Intellectual skills are those that require learners to think (rather than simply memorizing and recalling information).

Learning outcomes or objectives are specific measurable skills.

Psychomotor skills are those that require learners to carry out muscular actions.

Scrolling is a process for displaying more text than a screen can display by adding new text lines to the bottom of the display while the top lines disappear.

Variable spacing is present when the spacing between letters is reduced. Variable spacing requires less space than fixed spacing.

Verbal information is material, such as names of objects, that students simply have to memorize and recall.

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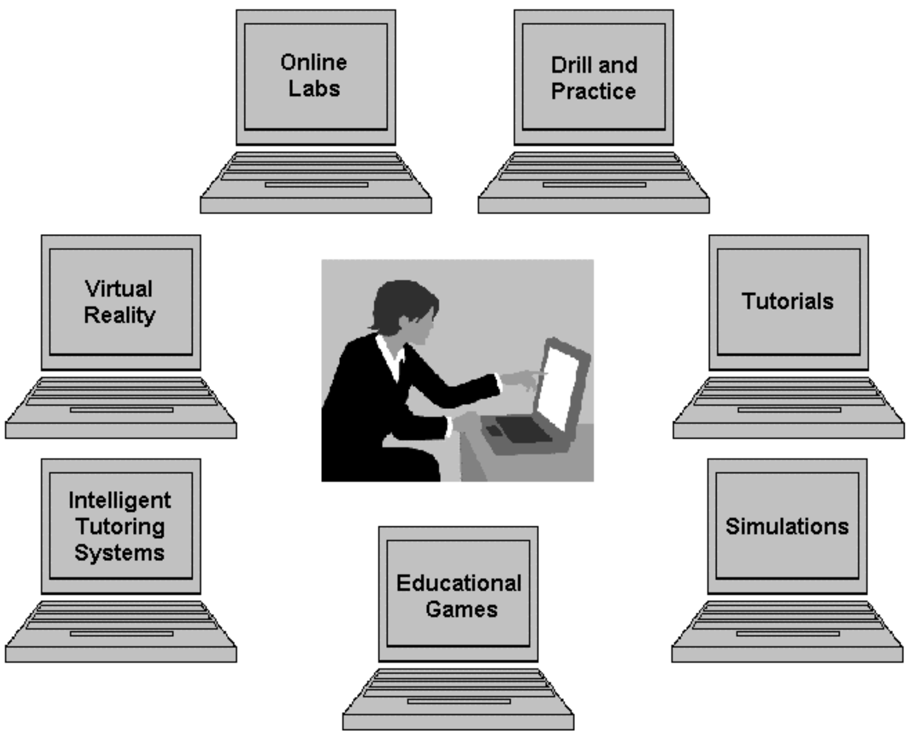
22
Computer-Based Resources for Learning

Peter Fenrich

To create an effective online lab, you may have to think differently than everyone else. Sometimes everyone else is wrong. – Irwin DeVries and Peter Fenrich



Learning outcomes

After completing this chapter, you should be able to:

- Teach practical skills effectively.
- Describe typical problems you may encounter when teaching practical skills in labs.
- Describe pros and cons of virtually controlling real equipment.
- Design effective lab tests for online learners.
- Gain acceptance for online labs.
- Discuss the future of online labs.
- Discuss the strengths and weaknesses of drill and practice programs, tutorials, simulations, educational games, intelligent tutoring systems, and virtual reality applications.
- Develop and select instructional materials.

Introduction

This chapter first focuses on the viability of teaching lab, shop, and other practical skills in a virtual environment. I discuss instructional design considerations for online labs as well as how educational technology can support online learners, especially given problems with "live" labs. I also discuss ideas regarding controlling real equipment, how lab tests can be handled, and ideas with respect to articulation. I also share some thoughts on the future of online labs. The instructional design topic will address learning outcomes that focus on important skills, content areas that will be stronger or weaker than traditional labs, and strategies for effectively teaching lab skills online. I will present a variety of computer-based resources that can support learners beyond more common online strategies. These resources include drill and practice programs, tutorials, simulations, and educational games. The chapter will conclude with brief notes on intelligent tutoring systems and virtual reality applications.

Online labs

Online (or virtual) labs simulate traditional settings, and sometimes take students beyond what can be done in a traditional lab. In general, there are two types of labs. One simulates real experiments, equipment, or procedures, while the other lets learners access and control real equipment from a remote location. These are different from software simulations that emulate real-world scenarios such as investing money, controlling power plants, and flying airplanes. An online lab is not created simply by transferring a lab workbook to a website, allowing students to access software from different campus or off-campus locations or enabling them to submit assignments via the Internet. In this chapter, the term "lab" is used generically for any setting where practical skills are taught, such as in labs, shops, and classrooms.

Some online labs let you simulate lab procedures or equipment. For example, using the computer's mouse, students can get a beaker, put a precise amount of a specific chemical in it, and virtually carry out all of the needed procedural steps. This is useful for preparing students to carry out lab procedures efficiently in a real-life lab. One problem is that online labs are much more valuable if the learner can also see the results. It would be ideal to let learners virtually mix chemicals and to provide opportunities that would be too costly or dangerous to carry out in a real lab. However, as the number of variables increases, the complexity of online lab design and possibilities increase. Imagine all of the possibilities with all of the different chemicals mixed together in different volumes, concentrations, combinations, and sequences. You could theoretically state what would happen for each case but, for practical reasons, students would not be able to see a video clip or animation of each possibility.

PROBLEMS WITH TEACHING LAB SKILLS IN TRADITIONAL WAYS

There can be numerous problems when teaching practical skills in typical face-to-face labs:

- When a demonstration is done, some students, such as those in the back of the class, may not be able to clearly see what is being demonstrated.
- Many instructors will not show all of the possible demonstrations, due to time, cost, or equipment limitations.
- Dangerous, expensive, or unavailable equipment or materials may limit what learners can see or do.
- The costs of building and maintaining labs are high.
  - Even if a lab can be built, funds are still needed to run labs. Staff, materials, and equipment replacement due to breakage as well as wear and tear are significant. Equipment upgrades are also a costly, important consideration.
- It may not be possible or practical to teach some skills.
  - For example, one way to teach troubleshooting involves taking components out of functioning systems, breaking them, putting them back in, and letting students determine the problem. However,

this is impractical because of the time it takes to remove, break, and install components, cost of later repairing the components, problem that this needs to be done to many components, and time required to have all of the students individually determine the problem for each broken component.

- In many cases, if a student misses a lab, they will not have the opportunity to do it later.
- Students are often not able to repeat a lab if something goes wrong. This is often due to time constraints.
- Existing media, needed to teach practical skills, may not be easily available.
  - A common illustration of this is where a repair person may need to see a series of video clips or photographs while working on equipment.
- Some existing traditional teaching materials that are used in labs are not effective.
  - In one case, a 20-minute videotape was created to train student mechanics how to disassemble and assemble an aircraft engine. However, the total disassembly and assembly requires approximately 200 steps. The videotape did not provide the details that the students needed.
- It may not be possible to offer live training.
  - Logistical challenges can arise when experts do not have enough time to travel to reach learners or even to simply have the time to teach (i.e., there is no extra time in their full-time job).
- Learners may not be able to attend live training locations.
  - This is an inherent problem in distance education. Many learners can learn the theory online or through other distance education solutions. However, they may not be able to learn the needed practical skills at a distance. Yet, these practical skills are often essential for enhancing learning.
- Costs to attend live training can be high.
  - This can be seen when numerous participants are required to travel to a workshop.
- There may be a need for just-in-time learning.
  - There are many times when a learner needs immediate training and cannot wait for a course or workshop to become available or be completed.

Given sound instructional design strategies, technology has solved these problems. For example, online labs can:

- show close-ups of procedures that all can see
- show extra demonstrations
- contain an individual's expertise
- offer alternative instructional approaches
- eliminate the costs of travelling to face-to-face labs
- be available when and where a student wants
- show expensive or dangerous procedures as the procedures would only have to be done once for the recording session and would then be available as needed
- include media, especially short, step-by-step video clips to illustrate specific concepts or procedures such as disassembling and assembling an aircraft engine.
- provide "just-in-time" learning

INSTRUCTIONAL DESIGN FOR ONLINE LABS

The general principles of instructional design apply to all educational materials. However, when designing online labs, there are other things to consider. These are discussed below.

Learning outcomes

Consider what the learner really needs to learn rather than what you want to teach or have traditionally taught. More specifically, for practical skills, determine what the learner actually needs to do. One way to do this is by imagining what skills the learner needs in the real world. To illustrate this, in some cases in the laboratory portion of chemistry, the learner does not really need to pour one chemical into another. The important skills relate to the observations, data analysis, and conclusions that are drawn. For teaching practical troubleshooting skills, the needed skill may be the ability to analyze the interrelationships between components of the system. Regardless, of the application, an online lab should simulate the actual practical skills needed to ensure that learning is authentic. In other words, online labs should focus on skills needed in the real world.

Tip

Focus on what the learner really needs to learn. Previously taught skills may not be relevant.

Creating the instructional strategy

The instructional challenge is to ensure that the practical skills taught via the computer transfer to the real world. Evidence supports that, with solid instructional design, this can be done. The foundation for the instructional design is the learning outcomes. The learning outcomes, lead to the design of the instructional strategy—what needs to be done to ensure that the students will effectively and efficiently learn.

For the instructional strategy, determine how to ensure that most all learners will learn effectively. This is a particular challenge when students are on their own and cannot have their questions immediately answered. Think outside the box to guarantee learning. Consider simulation, discovery-learning techniques, and active experimentation. Page-turning activities will not suffice for learning many practical skills. Use the technology for its strengths rather than simply transferring content from one format to another.

Tip
The key is to determine what needs to be done to ensure effective learning will occur.

Think about the limitations of teaching each skill online. You will have to realistically determine what level of skill you can achieve. For example, in an online biology lab, how would you teach a student to learn how to use a microscope? This is a limitation of using online technology. However, a lot can be done with visual media. You could show the coarse adjustment being used to focus an image, then show what would be seen inside the ocular lens, then show fine adjustments being made, and then what the learner would see inside the ocular lens. A practical activity could have the learner clicking on arrows to move the coarse and fine adjustments (clockwise and counter-clockwise) and see the corresponding image of what would be seen. The goal would be to find the clearest image. Video clips and activities can similarly be used for demonstrating other microscope components, such as the condenser lens. This would not be as good as what is done in a real lab, but would definitely give a sense of how a real microscope works.

Other activities could potentially lead to better results than a real lab. As a comparison, in a real lab, students see specimens and are then asked to draw what they see so that they can later study from their drawings. In an online lab, students will see full-colour video clips and photographs that they can later study for their lab test. One key in creating a successful online lab is getting as close as possible to reality (given constraints of time and money).

A part of the instructional strategy is to organize the information into small enough chunks for the students to successfully learn. A typical need for this is when a procedural skill has numerous steps. If so, consider teaching the entire process in logical groups of three to six steps. Many instructional resources provide too much information or too many steps for students to learn at one time.

Instructional strategies should include some content on the potential avenue for making mistakes. Ask the content expert about typical mistakes made after the content is taught in the traditional way. If one only teaches what is correct, the learner may never learn what can go wrong. Teaching what can go wrong is helpful in teaching students about safety in chemistry labs.

Tip
Address potential mistakes that learners make in live labs.

Teaching practical skills via computer usually requires a variety of specific media to enhance learning as well as to test skills. It is often difficult to test practical skills with only text. Plan in advance to record photographs and video clips of skills done incorrectly. These become excellent resources for testing. One challenge will be in creating the media needed since live labs typically depend on some copyrighted material. It is not safe to assume that you can get copyright clearance from the originators, especially if you plan to sell the product.

Determine whether assessment is realistic as a true measure of performance. This is particularly important for practical skills. When testing, consider all difficulty levels. Many existing technology-based resources are weak in that they only address low-level thinking skills rather than the actual skills needed.

Make the program highly interactive throughout. Interactivity requires the learner to actively think while learning. Creating interactions in the virtual environment is easily done. You can have students drag and drop items, increase and decrease settings to observe results, make decisions and see consequences, and answer questions based on video clips and photographs showing correct and incorrect procedures or results. Remember to always provide detailed feedback, even when the answer is right. This is in case the student guessed the correct answer or answered correctly for the wrong reason(s).

Tip
Ensure that you keep the learner engaged and thinking throughout.

CONTROLLING REAL EQUIPMENT

Virtually controlling real equipment can be challenging. One problem is enabling control across computer platforms. Although it is not trivial, it can be solved with web-based tools that are designed for interoperability and machine-to-machine interaction over a network. However, this is a major problem if the equipment is not designed for remote access. Virtual control may require a lab technician for some tasks such as preparing and loading samples. Will this need to be done 24 hours per day and seven days per week? It is hard to generalize whether the overall labour, materials, and facilities costs will be higher for live labs or virtual labs that enable remote control of real equipment.

There may be some logistical problems with allowing remote access to equipment. Imagine if 100 students signed up for a course that included remote access to equipment. Consider 1,000 virtual students. Can large numbers of virtual students be supported? What if "live" students also need to access the equipment? What happens if a virtual student wants to access equipment that another virtual student is using? How does a lab technician support more than one virtual student at a time? When will the equipment be available for virtual students? How many units will be available for remote control?

Tip
Determine the logistics, benefits, and costs of virtually controlling real equipment before taking on such a project.

HANDLING LAB TESTS

Lab tests can be done any way you want. You can:

- Have students come to campus to be tested in a live lab. However, this would prevent some students from being able to complete an online program.
- Require students to write paper-based exams. It may be that only a portion of the skills could be adequately tested in a paper-based format. Invigilation may need to be addressed.
- Have learners complete a computer-delivered test. The test could be wholly or partially based on learning objects, especially video clips and photographs, already used in the online lab. Invigilation may need to be addressed.

ARTICULATION

Articulation may be an issue. Some people will simply be adverse to change, or assume that an online lab is inferior to a live lab. Other people will argue that you cannot replace the real thing, or that some things cannot be simulated online. (Sometimes the sense of touch and smell play important roles in learning.) Since most online labs only show the correct results, some will resist online labs because an advantage of actual labs is that significant learning takes place through mistakes that students make. (You can disarm that argument by addressing typical errors in your designs.) Yet others will need research confirmation of effective results before accepting the technology. The good news is that some are claiming that online labs can be rigorous enough to be equivalent to actual labs. An online lab you create might initially only be approved for a limited group of students (e.g., non-science majors).

You will need to gain the support of all stakeholders. You can foster initial acceptance by involving articulation committee members in the formative evaluation and later conducting a summative evaluation. With successful results in a summative evaluation, it is more likely that there will be approval for any student to learn via an online lab.

Articulation is more fully discussed in Chapter 12, Articulation and Transfer of Online Courses.

Tip
Do what you can to ensure you get the support of the articulation committee.

THE FUTURE OF ONLINE LABS

It is difficult to predict the future of online labs. However, the reality is that online labs will continue to be created. Some will be of minimal value while others will effectively meet the needs of distance learners and solve the previously mentioned problems of live labs. Some questions will need to be answered:

- Can all labs, ranging from introductory to advanced, be delivered online?
  - In some courses, all of the lab skills can be successfully delivered online, while in others the labs should only be offered live. There is a limit to how much can be conducted online. Would it be reasonable for a student to get a biology degree without ever working with real specimens and a real microscope and other lab equipment? It is likely that everyone would answer this question with a resounding "No".
- Will administrators of post-secondary institutes or the government require the use of online labs to save costs?
  - Only time will tell. Already many institutions have opted to have labs every second week. The official rationale is that this enables students to be better prepared for labs. The reality is that it is to save costs. One option is to conduct every second lab online. This would accommodate a larger number of students when there are limited lab resources. Note that some governments have already applied pressure to eliminate some labs.

– Another option is to use online labs to speed up lab time. If students know exactly what procedures they will be doing online, they can spend less time in the live lab, thus freeing up room for more students.

Tip
Be ready to answer questions about the effectiveness and economy of an online lab.

Computer-based resources

The following computer-based resources for learning (drill and practice, tutorials, simulations, educational games, intelligent tutoring systems, and virtual reality) are sometimes needed to support learners when more common online strategies, described in other parts of this book, will not suffice. Some drill and practice activities can be effectively provided within learning management systems. However, depending on the learning domain, thinking level required, complexity of the problem presentation, and feedback that needs to be provided, some drill and practice activities will need to be created on tools such as Macromedia Flash. In general, all of the other resources described below need to be created on software that is not found within learning management systems.

Drill and practice programs

Drill and practice is a common computer-based training strategy that provides repeated activity (drill) and opportunities (practice) to try skills or concepts learned elsewhere. This is shown in Figure 22.1. The aim is often to achieve mastery.

Drill and practice:

- Usually takes place after the content has been taught.
- Does not teach new material.
- Can, and often should, include extensive diagnostic feedback.
- Can be used for many skills such as learning language, learning factual information, and solving problems in mathematics, physics, chemistry, electricity, nursing, etc.
- Should usually have a varied difficulty level that is based on the student's ability in order to enhance learning.
- Can be boring.
  – You can counter boredom with competition, using visuals, providing variety, stating the progress made, or giving a reward if a target is met.

Tutorials

Tutorials are programs in which the computer imitates a human tutor. This is shown in Figure 22.2. In tutorials, information or concepts are presented, questions are asked, responses are judged, and feedback is provided.

Tutorials:

- Should include frequent questions and/or other activities that require the learner to think, as well as provide detailed feedback.
- Can be used for many low- and high-level skills.
- Can include drill and practice.
- Can include solving problems.
- Often include branching to remediation and enrichment.
- Often include testing.

Simulations

Simulations present or model the essential elements of real or imaginary situations. This is shown in Figure 22.3. Computer-based simulations (e.g., flight simulators) allow students to learn by manipulating the model in similar ways to real world situations. Simulations can immediately respond with consequences to learner decisions. However, some consequences may not initially be apparent, depending on when the effect is normally seen (e.g., the effects of changes in interest rates may be seen years later). Students can learn by observing results and relationships (this can be through a discovery-learning strategy) or receiving specific diagnostic feedback, especially when detailed feedback is provided for both right and wrong answers.

Ideally, simulations should approximate real systems as closely as possible. This helps facilitate transferring the knowledge learned to the real world and can make the simulation particularly meaningful to the learners. How closely a simulation must approach reality depends on the complexity of the real situation, how well the skills learned will transfer to the real situation, and the benefits and costs of making the simulation more realistic. Conduct a detailed analysis to determine all of the relevant skills needed and their importance.

Simulations can be used for teaching many skills including:

- Properties of physical objects such as a comet in its orbit
- Rules and strategies such as in war games, making predictions about forest fire behaviour or avalanche potential, or building a city
- Processes such as laws of supply and demand
- Procedures such as diagnosing illnesses
- Situations such as teaching instructors how to deal with student behaviour and attitudes

Simulations are often used when real situation training is:

- Dangerous (e.g., nuclear power plant procedures and police maneuvers)
- Expensive (e.g., landing a space shuttle)
- Unethical (e.g., when it is not appropriate to use humans)
- Not easily repeatable (e.g., avoiding a run on a bank)
- Unavailable (e.g., historical events such as the economics of the Great Depression, how to respond in a robbery, or operating a business)
- Not conducive to learning (e.g., when learning is difficult because the learner must consider too many stimuli at once, such as in the cockpit of a modern airplane)
- Affected by reality such as time (e.g., simulations can provide genetic data about successive generations immediately, where reality could take months or years)
- Inconvenient (e.g., experiencing Arctic survival, undersea, and outer space conditions).

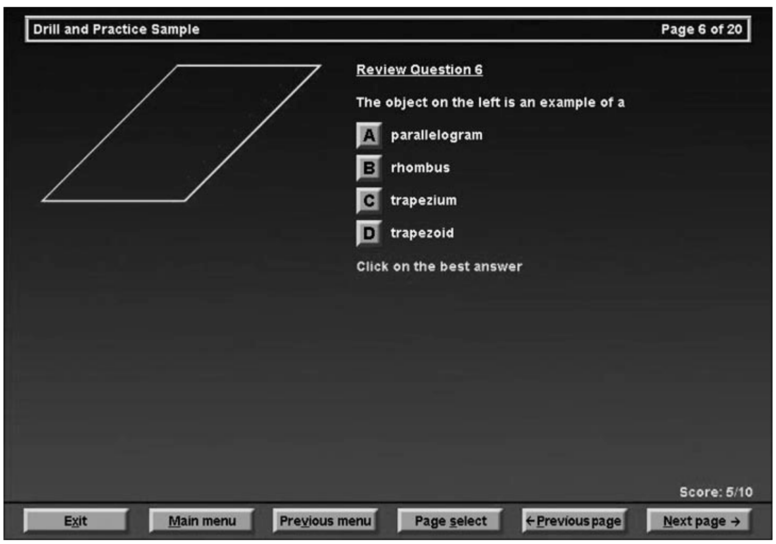


Figure 22.1. Drill and practice sample

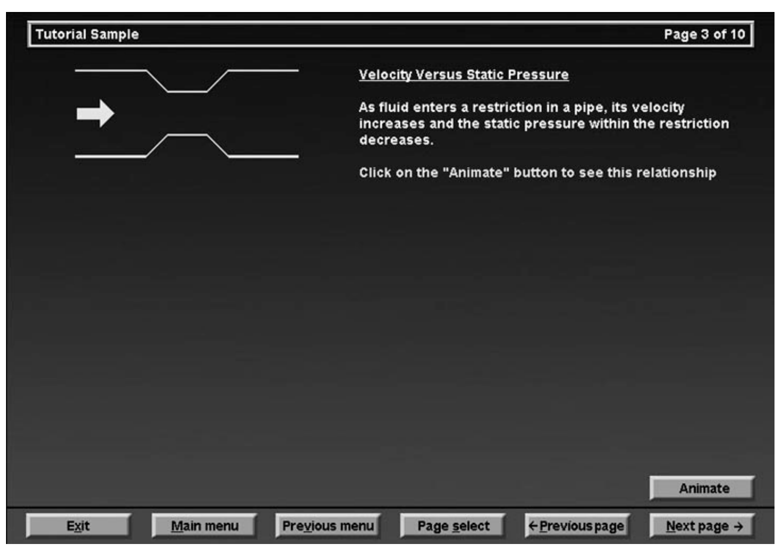


Figure 22.2. Tutorial sample

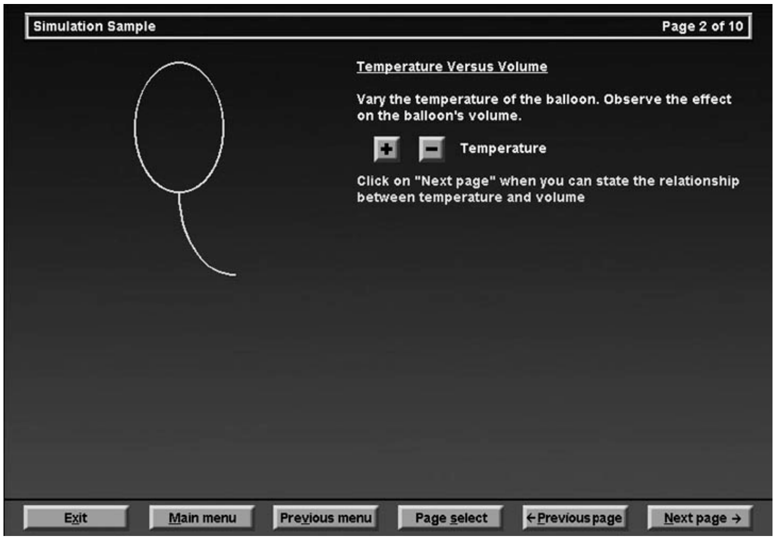


Figure 22.3. Simulation sample

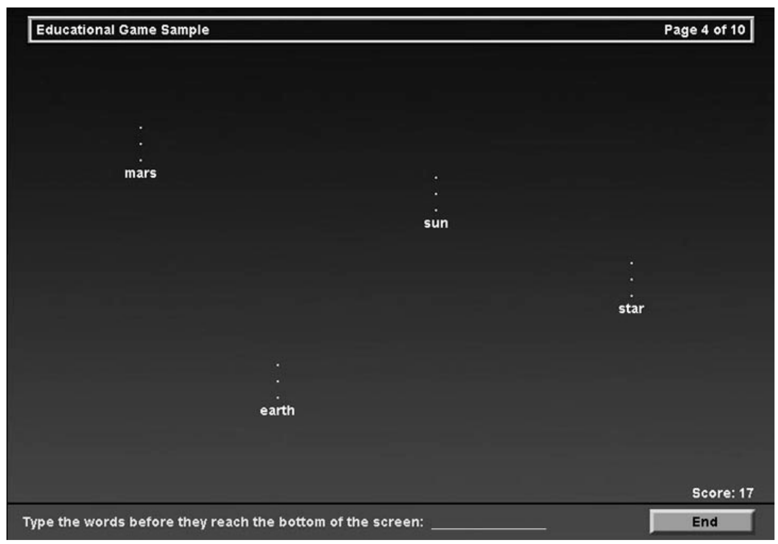


Figure 22.4. Educational game sample

Simulations can be very effective.

- The knowledge gained tends to transfer well to real situations if students can apply their existing knowledge and experience. Active student participation is critical.
- Effectiveness increases if the simulation is logical or comparable to real situations.
- Effectiveness is enhanced if students are aware of the learning outcomes.
- Effectiveness increases if students can gradually build their skills. For example, when first learning how to operate a nuclear power plant, the student should first learn each system independently, then combinations of dependent systems, and then the entire system.
- Effectiveness can stem from students being very motivated to learn. Imagine your motivation if you are involved in a life and death situation, or investing your life savings.

Attaining excellent results requires more explanations of the goals, learning outcomes, and directions than tutorials or drill and practice methods. Some learners, such as young or immature students, will have trouble explaining what has happened in a simulation, or transferring the knowledge to real situations.

Note that students may not necessarily believe the results of a simulation. As an example, in a simulation, students may end up in a car accident if they chose to drink and drive. However, there is no guarantee that students believe that could happen to them in real life.

Simulations can be very efficient for relatively quick learning. The efficiency increases if:

- the model or simulation closely represents reality.
- learners receive useful feedback with respect to the learner outcomes.
- the model or simulation is aimed at the appropriate learning level.
  - Novices may learn best when only some of the variables can be manipulated, and experts when presented with the entire model.
- the level of detail is appropriate.
  - If too much detail or too many parts of the system are shown, learning may be hindered since the learner may not be able to mentally process all of the information.
- supplementary material is provided.
  - Text summaries and checklists can be very beneficial.

Effective, efficient simulations are usually expensive and time-consuming to create. Cost-justification is particularly important before creating a simulation.

Educational games

Educational games are usually decision-making activities that include rules, a goal, conditions or constraints, competition, challenge, strategies, and feedback. Games can be as simple as answering questions to win Tic-Tac-Toe or filling in crossword answers to more complex games that require interactions with other learners.

Educational games:

- should encourage the development of specific skills
  - The skills can be in specific subject areas such as science and math or general skills like literacy, problem solving, critical thinking, and decision-making.
  - Success should be based on whether the specific learning outcomes have been met, rather than on good hand-eye coordination.
- can be used to teach many different skills
  - The example shown in figure 22.4 illustrates how a game can be used to teach keyboarding skills.
  - One difficulty is that games tend to require more explanations of the goals, learning outcomes, and directions than tutorials or drill and practice methods. Without guidance, learning is less effective.
- can be an effective, motivational, and fun way to learn
  - To be effective, the game must be challenging, students must be actively involved, and students must be given feedback and guidance with respect to the learning outcomes.
  - Research has shown that many learners like to learn through educational games.
  - Some educational games are a part of simulations that involve competition and/or cooperation.
  - Both males and females can enjoy and learn from games suited to their interests.
- are sometimes a waste of time
  - Some products are fancy but do not teach well.
  - Evaluate a game before purchasing it to ensure that the game teaches an important skill effectively. Some games may lead to violent and aggressive behaviours.
  - Some people erroneously believe that games cannot be effective teaching tools.

Intelligent tutoring systems

Intelligent tutoring systems attempt to mimic the "perfect instructor". The basic requirements of an intelligent tutoring system include the ability to:

- model the learner
- track misunderstandings
- generate appropriate responses.

None of these basic requirements have been perfectly resolved.

Although it is possible to incorporate a model or two of student learning into a computer-based training application, a fixed model does not represent intelligence. How can a "typical" student be modelled when students and their learning preferences are so diverse? It is not sufficient to simply categorize students into one of two types and then create two ways for students to learn the material. This has been the premise in some "intelligent" tutoring systems. A compounding factor is that learner preferences vary depending on the situation and material being taught. It is impractical to create a different teaching strategy for every individual. See Chapter 20, Learning Strategies, for more information on learning styles.

Although intelligent tutoring systems should be adaptable, based on the learner's previous successes and failures, it is a challenging goal. It is simple to record where students make mistakes, but a challenge to know when there is a misunderstanding, what caused it, and what to do about it. In a sense, the computer would have to be able to read each student's mind.

Generating the appropriate response would be difficult even if the first two needs were met. How can a designer determine all of the response possibilities? Every possibility must be based on a known rule. Intelligent tutoring systems can and should have responses for expected misunderstandings but this is, at best, limited to the finite expressed problems.

There are some excellent intelligent tutoring systems available. However, these tend to be labour-intensive and expensive to develop. Although the potential of intelligent tutoring systems is exciting, the reality is that much research still needs to be done. In other words, instructors need not worry about being replaced by an intelligent tutoring system. Given the present state of the technology, it can be argued that well-designed instructional multimedia applications are essentially the same from a student's perspective.

Virtual reality

Virtual reality (VR) allows people to be totally immersed in an artificial or simulated environment, while experiencing the environment as real. This happens because the participant has a first-hand or personal experience of the events, distractions are minimized since only virtual images are seen, and the participant can interact naturally in real time, such as by pointing and looking, rather than by using a joystick, mouse, or keyboard. VR can feel so real that some people experience vertigo when sensory inputs to the brain are in conflict. VR systems can include a variety of media such as video, visuals, animation, and audio. In a sense, VR is an extension of simulations that can be created with readily available hardware and software. Commercial flight simulators are examples of this.

A distinctive feature of VR is that learners are an integral part of the synthetic VR world. Users can simultaneously interact with computers in complex ways. Computers can sense body movement and voice commands and respond almost naturally. For example, for teaching students about interior decoration, you could let students walk through a house and allow them to change colours of walls, rearrange furniture, change the lighting, and remove a painting and place it elsewhere. To interface with the virtual world, learners must wear specialized equipment such as body suits, goggles, and/or gloves.

Although most applications are found in the entertainment industry, numerous educational products have been and are being developed. Since VR allows participants to feel that they are in another place in which they can move and look around based on a prescribed set of rules, VR offers incredible educational potential. Imagine how much doctors, army field surgeons, soldiers, firefighters, and law officers, could safely learn in a virtual environment. Abstract ideas, such as the movement of electrons in an atom that cannot be physically presented, can be taught with VR. Since virtual objects can behave as their physical counterparts and be manipulated by the learner, students can experience natural laws such as the law of gravity. Alternatively, learners can experience unnatural laws created by developers. In a virtual world, energy could be created or destroyed. With the ability in VR to manipulate abstract information, the potential exists to improve a student's understanding and memory of complex ideas.

Learning can be by discovery, experimentation, through guidance using a variety of instructional approaches, or by practice and feedback. The potential for testing in a virtual environment is exceptional. For example, students could virtually perform an operation, put out a fire, or apprehend a thief.

For practical reasons, it can be risky to develop an educational VR system at this time:

- There are few experts in VR design and programming.
- The authoring software is mediocre but getting better.
- Extra equipment is needed for developing and using these programs.

A key to effective VR design is to focus on the potential to teach and learn rather than on the hardware and software tools.

Given the potential of multimedia technology, where is the boundary between computer-based simulations and virtual reality applications?

Summary

Online labs simulate and teach what learners must do in traditional settings. In general, there are two types of labs. One simulates the real experiments, equipment, or procedures; the other lets learners access and control real equipment remotely. There can be numerous problems when teaching practical skills in typical labs. Online labs can solve many of the problems.

Online labs will continue to be created. Some will be of minimal value while others will effectively meet the needs of distance learners. Some questions will need to be answered:

- Can the labs of all courses, ranging from introductory to advanced, be delivered online?
- Will administrators, of post-secondary institutes or the government, require the use of online labs to save costs?

The instructional challenge is to ensure that the practical skills taught via the computer transfer to the real world. The foundation for the instructional design is the learning outcomes, which should be based on what the learner actually needs to do. Based on your learning outcomes, the design phase leads you to creating an instructional strategy that guarantees effective learning. To do this:

- Consider simulation, discovery-learning techniques, and active experimentation.
- Determine what level of skill you can achieve.
- Organize the information into small enough chunks for the students to learn successfully.
- Include some content on the potential for making mistakes.
- Include media, as needed, to enhance learning as well as to test skills.
- Determine whether testing is realistic enough and a true performance measure.
- Make the program highly interactive throughout.

Some online labs enable learners to control real equipment. Virtually controlling equipment can be challenging and may save some money.

For lab tests, you can:

- have students come to campus to be tested in a live lab
- require students to write paper-based exams
- have learners complete a computer-delivered test

Articulation may be an issue. Many will find reasons to resist the technology. You can increase acceptance by involving articulation committee members in the formative evaluation. You can also gain support if a summative evaluation proves successful results.

The following computer-based resources are sometimes needed to support learners when the more common online strategies will not suffice:

- Drill and practice is a common computer-based training strategy that provides repeated opportunities to try skills or concepts learned elsewhere.
- Tutorials are programs in which the computer imitates a human tutor. In tutorials, information or concepts are presented, questions are asked, responses are judged, and feedback is provided.
- Simulations present or model the essential elements of real or imaginary situations. Ideally, simulations should approximate real systems as closely as possible. Simulations can be used for teaching many diverse skills. Students can learn by observing results and relationships or receiving specific diagnostic feedback.
- Educational games are usually decision-making activities that include rules, a goal, conditions or constraints, competition, challenge, strategies, and feedback.
- Intelligent tutoring systems attempt to mimic the "perfect instructor". The basic requirements of intelligent tutoring systems include the ability to model the learner, track misunderstandings, and generate appropriate responses.
- Virtual reality (VR) allows people to be totally immersed in an artificial or simulated environment yet retain the feeling that the environment is real. A distinctive feature of VR is that learners are an integral part of the synthetic VR world. Users can simultaneously interact with computers in complex ways.

Glossary

Copyright. The exclusive privilege allowing authors or assignees the right to copy, sell, and/or transmit their own original work.

Drill and practice. A type of instructional multimedia that provides repeated activity (drill) and opportunities (practice) to try skills or concepts learned elsewhere.

Educational games. Usually decision-making activities that can include rules, a goal, conditions or constraints, competition, challenge, strategies, and feedback.

Feedback. Any message or display given to a learner based on his or her input.

Instructional design. The specific systematic, repetitive process of activities aimed at creating a solution for an instructional problem.

Instructional strategies. Components of a set of instructional materials and the activities that the students must do to achieve the learning outcomes.

Intellectual skills. Skills that require learners to think (rather than simply memorizing and recalling information).

Intelligent tutoring systems. Computer programs that attempt to mimic perfect instructors.

Interactivity. Active learner participation in the learning process.

Learning outcomes. Specific measurable skills.

Learning styles. Characteristic behaviours that indicate how students prefer to learn. Also known as cognitive styles or learning preferences.

Online labs. Web-based labs that simulate and teach what learners must do and learn in traditional settings.

Psychomotor skills. Skills that require learners to carry out muscular actions.

Simulations. Interactive models that mimic the essential elements of real or imaginary situations.

Tutorials. Computer programs that imitate a human tutor.

Virtual reality. A type of computer program that allows people to be totally immersed in an artificial or simulated environment yet retain the feeling that the environment is real.

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23

Computer-Based Games for Learning

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Simon Fraser University and SAGE for Learning *Project*

The really basic skill today is the skill of learning, and the best use of games is to leverage their tendency to enhance it. – Papert (1998)

Learning outcomes

After completing this chapter, you should be able to:

- Define *game*, *simulation* and *simulation game* and give examples of each.
- Describe the theoretical arguments for using computer-based games for learning.
- Describe features of computer-based games for learning that contribute to their effectiveness.
- Describe possible approaches to implementing computer-based games for learning in your context.
- Describe possible approaches to creating your own games for learning.

Introduction

Computer-based games are a major entertainment and cultural force (Gamasutra, 2006). Creative ideas using sophisticated graphics and communication technologies are changing the way we spend our leisure time, build friendships and communities, try out new identities, and practise new skills. Whether or not computer-based games are part of your daily life, they offer tremendous opportunities to engage and challenge your students.

You may be a gamer, familiar with the Xbox, Grand Theft Auto, and EverQuest,, and wondering why school isn't as absorbing as your late-night game sessions. You may be a boomer professor, curious but not sure how games could be relevant to your teaching. Or you may be somewhere in between.

This chapter gives you a broad introduction to the use of computer-based games for learning. We start with basic terms and move on to look at why these activities can be powerful learning tools, drawing on current learning theory, game research, and recent experience. After presenting examples to spark your own learning-game ideas, we discuss factors that make learning games effective. The chapter closes with tips for successfully getting started using games in your learning context.

"Square one": what are we talking about?

Because the word "game" can describe many very different activities and varieties of play, we start with a few definitions. Speaking very generally,

> A *game* is a set of activities with goals, rules, and competition (possibly with oneself) that involve one or more players in an artificial situation (Dempsey et al., 1996; Sauvé et al., under review).

Games such as tennis, basketball, Tic Tac Toe, chess, checkers, and Monopoly have been around much longer than computers. Since personal game machines and computers have become widely available, a wide variety of dynamic, interactive electronic games have appeared in many genres. Some familiar titles are the Carmen Sandiego series, Myst, Doom, various sports games, and EverQuest.

Many computer-based games are based on simulations, for example: The Sims, Roller Coaster Tycoon, or MBA management training games.

> A *simulation* is a dynamic, simplified but accurate systems model of aspects of reality (Sauvé et al., under review).

Simulations in which learners have defined roles, with responsibilities, constraints, and feedback in complex data-rich environments, allow them to develop problem-solving skills and experience the effects of their decisions (Gredler, 2004). Simulations are often useful because they let players learn from their mistakes without, for example, crashing planes, killing patients, or sending companies into bankruptcy.

Adding performance goals, scoring, and competition among players or with oneself can turn a simulation into a game (Sauvé et al., under review; Sauvé et al., 2005a). The term *simulation game* refers to these hybrids and includes a wide variety of commercial games that simulate real-world activities. The distinction among games, simulations, and simulation games is important as a foundation for studies relating learning outcome effectiveness to characteristics of the learning activity (Sauvé et al., under review).

Games can use a variety of technologies including boards and tokens, fields and balls, dedicated game machines (PlayStation, Xbox, Nintendo DS), personal computers, and handheld devices (cell phones, personal digital assistants [PDAs]). In this chapter we focus on games for computers and handhelds.

An Internet search will lead you to games for learning in practically any discipline. Some examples, found on the Social Impact Games site (http://www.socialimpactgames.com), include:

- *education games* covering school subjects such as algebra, history, chemistry, computer software, and criminology;
- *public policy games* designed to educate the public on citizenship, democratic participation, and policy issues, such as Cyberbudget France on the French national budget, and several US election-related games;
- *political and social games* designed to stimulate discussion or promote views on world issues (e.g., world agriculture, drug dealing, human rights);
- *health and wellness games* teaching about health issues and management (e.g., for asthma, cancer, heart health, child predators, and self-esteem); and
- *learning applications of commercial games:* job simulations (e.g., emergency room), resource management (SimCity, Railroad Tycoon), history (e.g., Oregon Trail, Rise of Nations).

Similarly, simulation applications are many and varied, including:

- *business:* Computational models that generate business results and provide feedback for practising planning and decision-making for simulated periods (e.g., months, years). Goals are often profit-related. Areas include strategic management, marketing, finance, operations, investments; specific industry simulations, e.g., the Cornell Management Game (http://www.cms-training.com/);
- *public policy*: Simulations of government, educational, or international organizations or scenarios, e.g., Virtual U university management simulation (http://www.virtual-u.org/);
- *military training:* War strategy, equipment, battle, support scenarios, e.g., America's Army, a virtual online army simulation (aimed at recruiting) produced by the US government (http://www.americasarmy.com/);
- *flight***:** Simulations of specific aircraft controls, airports, flight paths, e.g., CAE commercial training simulators (http://www.cae.com); PC-based flight simulators (http://www.pcaviator.com or http://www.microsoft.com/games/flightsimulator/);
- *medicine***:** Physical or computer-based models of medical processes and problems for developing and testing clinical skills, e.g., patient simulators, surgical simulators (http://www.msr.org.il/About_MSR/Medical_Simulation_Equipment/);
- *emergency response***:** Immersive emergency scenarios and environments for testing systems and decisions, e.g., Unreal Triage (http://www.ists.dartmouth.edu/projects/seers/utriage.php); and
- *leadership development:* Simulated scenarios for practising interpersonal and leadership skills, such as Virtual Leader (http://www.simulearn.net/leadershiptraining.html), Change Game (http://www.vanderbilt.edu/lead/simulations.html).

For the rest of this chapter, we will be concerned with games, simulation games and game-like simulated environments that involve play, exploration, and problem-solving but may or may not required explicit scoring and competition. In common with the popular use of the term, we will use "games" to refer to them collectively. Training simulations that are specifically oriented towards technical skills development, e.g., flight simulators and medical patient simulators are beyond the scope of this discussion.

Computer-based games are played by individuals and groups in many configurations. They can be single- or multi-player, played on a single computer, or multiple networked machines, in classrooms, or online. Handheld games can also support individual learning or collaborative learning with teams and groups, and particularly lend themselves to games involving player movement around physical settings. Internet-based massively multiplayer online games (MMOGs) attract thousands of players in complex, evolving interactions and scenarios, including ones created by players themselves. Computers and especially handhelds can also be used to support blended learning situations in which game play happens through face-to-face interactions and activities rather than on screens.

Example

Second Life is a virtual online world built by its "residents" and populated by their avatars (online characters). It includes a dedicated campus area where educators can build and offer virtual classes including simulations. Here learners can "use simulation in a safe environment to enhance experiential learning, allowing individuals to practise skills, try new ideas, and learn from their mistakes. Students and educators can work together in Second Life from anywhere in the world as part of a globally networked virtual classroom environment." (http://secondlife.com/community/education.php)

Why use computer-based games for learning?

Several factors have recently converged to propel learning applications for computer-based games.

POPULARITY AND ACCESS

First, games are widely popular and accessible as entertainment; the Canadian video game market will increase from $732 million in 2005 to $1.3 billion in 2010, while global video game spending is expected to rise from $27.1 billion in 2005 to $46.5 billion in 2010 (Forest, 2006). A 2002 US survey found that 92 percent of children and adolescents ages 2 to 17 played video games, and more than two-thirds of all children ages 2 to 18 lived in a home with a video game system (Kaiser Family Foundation 2002). As well, 61 percent of Canadian households and 75 percent of US households used mobile phones in 2005 (Wright, 2006). Using games for learning builds on their familiarity and relatively easy access.

PLAYER ENGAGEMENT

Computer games are highly engaging. Today's games offer motivating, absorbing, interactive, collaborative experiences that draw in players and keep them playing for many hours, often developing complex social networks in the process.

A growing body of literature analyzes aspects of games that foster player engagement and motivation. Asgari and Kaufman (2004) cite three categories of factors that sustain a game's intrinsic motivation so that a player will play for his/ her own interest and enjoyment, even in the absence of external rewards:

Table 23.1. Intrinsically Motivating Features of Games (Asgari & Kaufman, 2004)

Feature Category	Examples
Psychological: those that meet individual needs	Features that meet needs for competence, self-determination, interest-excitement, enjoyment.
Structural: related to the inner structure of a game	Complexity, novelty, unpredictability, uncertain outcomes, challenge, feedback, fantasy, curiosity, control, interactivity, competition
Implementation: related to the way a game is implemented and presented to the player	Graphics and sound, having multiple players, using well-known characters or settings, high speed, useful interface, "save game" capability

Prensky (2001a) lists twelve elements that make computer games engaging:

Table 23.2. Twelve Elements that make Computer Games Engaging (Prensky (2001a), quoted in Mitchell & Savill-Smith, 2004)

Game Characteristic	Contribution to Players' Engagement
Fun	Enjoyment and pleasure
Play	Intense and passionate involvement
Rules	Structure
Goals	Motivation
Interaction	Doing the activity
Outcomes and feedback	Learning
Adaptive	"Flow" state
Winning	Ego gratification
Conflict/competition/ challenge and opposition	Adrenaline
Problem solving	Sparks creativity
Social interaction	Social groups
Representation and a story	Emotion

Another analysis of games' engaging quality focuses on players' experience of "flow", a state of intense concentration and focus in which they have a balance between ability level and challenge, a sense of personal control over the situation, and a sense of intrinsic reward from the play (Csikszentmihalyi, 1990). Well-designed games do this by, among other things, having multiple skills levels so that players face new but achievable challenges as they develop mastery of lower levels.

Gee (2003) explains player engagement in terms of *semiotic domains* (worlds of symbols, meanings, practices, and experiences). He points out that games can be very challenging and time-consuming, yet young players who might spend little time on schoolwork become absorbed in games and learn complex knowledge, responses, and behaviours in order to win. In his words,

> A game like Pikmin recruits from our six-year-old a complex identity composed of various related traits. The game encourages him to think of himself as an active problem solver, one who persists in trying to solve problems even after making mistakes; one who, in fact, does not see mistakes as errors but as opportunities for reflection and learning. It encourages him to be the sort of problem solver who, rather than ritualizing the solutions to problems, leaves himself open to undoing

former mastery and finding new ways to solve new problems in new situations.

Gee suggests that players take on and master lengthy, complex games because they become involved in new semiotic domains and affinity groups, resulting in new identities (e.g., a game character with abilities, faults, and decisions to be made) and situated learning that can be transferred to other domains. Squire (2005) suggests that this focus on new identities is leading to new computer-based games that build new attitudes and behaviours for players in simulated management and advertising settings.

THEORY-BASED SUPPORT

Computer-based games embody current learning theories. For example,

- *Constructivist learning* (Boethel & Dimock, 1999; Vygotsky, 1978): When requiring exploration, collaboration, and complex problem-solving, games can help players to explore, discover, articulate, and create their own understanding of complex phenomena;
- *Situated cognition, cognitive apprenticeship, and experiential learning* (Kolb, 1984; Schank & Neaman, 2001): When they create simulated authentic contexts and activities that involve social interaction, games can support both understanding and skill development. Also, skill development increases with learning by doing, and feedback in a safe environment;
- *Self-efficacy* (Bandura, 1986; Kaufman et al., 2000): Through learner control and increasing achievement levels, games can provide opportunities for successful experiences to help develop self-efficacy and positive attitudes concurrently with knowledge and skills.
- *Learner-centredness* (McCombs and Whistler, 1997): Games can transform traditional teacher and learner roles so that learners shift from a passive to an active role, and from learner to teacher through active exploration, experimentation, discovery, and collaboration with peers.

EVIDENCE OF LEARNING OUTCOMES

A number of studies have demonstrated the effectiveness of games for cognitive, emotional and psychomotor learning. For examples, see Baranowski et al. (2003), Kirriemuir & McFarlane (2004), Lieberman (2001), Roubidoux (2002), Sauvé et al. (2005b), and Steinman & Blastos (2002). According to these, games motivate learning, offer immediate feedback, consolidate knowledge, support skills development and application, aid learning transfer, and influence changes in behaviour and attitudes, all pointing to greater learning effectiveness with simulations and games.

NEW-GENERATION LEARNING MODEL

Finally, some observers argue that new generations of learners are developing new cognitive processes and a culture that is changing the nature of learning. Learning may be evolving into a much more "unruly," less controlled process than we have been accustomed to in our classrooms (Seely Brown, 2002). Prensky (2001a) and others suggest that the "game generation" has developed a new cognitive style characterized by multitasking, a short attention span, and learning through exploration and discovery; today's games provide their ideal learning environment.

Examples

Case studies of Lineage (Steinkuehler, 2004) and World of Warcraft (Lau, 2005) describes how these MMOGs develop online communities of practice that foster learning as social practice through "situated understandings, effective social practices, powerful identities, shared values, and shared ways of thinking" (quote from Lau, 2005).

Game-based learning examples

To move from theory into practice, some concrete examples show how games are being used for learning from K–12 through university and professional training levels.

- **Educational Games Central:** A pioneer in the use of computer-based games for learning, the *Carrefour virtuel du jeux éducatifs,* operated by the SAVIE research centre at the Université du Québec à Montréal, has recently been translated into English as Educational Games Central (EGC). The site (http://www.savie.qc.ca/carrefourjeux/an/accueil.htm) provides "frame games"—generic frameworks for well-known board games and game-show contests (e.g., Tic Tac Toe, Trivial Pursuit, Concentration, Snakes and Ladders) into which questions, problems, answers, and feedback can be entered to create specific games in any content area. Because each game shell is designed to let a teacher produce a game in an hour or two (once the content is developed), EGC can be used in the classroom or in a training context without extensive training or infrastructure. Its games are accessed on the Internet by individual players or teams; the newly released ENJEUX multiplayer environment (http://www.savie.ca/enjeux) supports their use for multiple players online at different sites. Performance and research statistics can be collected for each play session.

Although EGC games are based on more traditional question-and-answer exercises, they have proved very successful in using play and competition to engage learners from young children to adults. EGC games have recently been used for several health-related applications as part of the *SAGE for Learning* research project (http://www.sageforlearning.ca) on games and simulations for learning.

- **COTS games in the schools:** Commercial off-the-shelf (referred to as COTS) games have being applied in many learning contexts. In one example, a school in the US reports using Roller Coaster Tycoon projects to teach momentum, speed, mass, and other concepts in junior-high physics classes (Kirremuir, 2006a). In another case, SimCity is being used for a complex Grade 6 to 8 project to create and manage a small city's infrastructure and environmental impact (Kirriemuir, 2006b). In a third example, the Education Arcade project at MIT used Civilization III to teach high school and middle school social studies. The researchers found that students used much more complex concepts than expected. One student commented, "What I learned is that you can't separate economics from politics or geography. What natural resources I have or where I'm located affects how I can negotiate with other civilizations." (Jenkins & Squire, 2003).
- **University, adult and professional learning:** A project at Purdue University is building the Critical Mass video game to teach university chemistry through an adventure mission that requires solving chemistry problems (http://web.ics.purdue.edu/~kmartine/). Virtual-U (http://www.virtual-u.org/) lets players experience the intricacies of university management. Public Health Games (http://www.publichealthgames.com/), a centre at the University of Illinois at Chicago, is creating "state of the art games for public health workers and emergency responders for a multitude of catastrophic scenarios," including an anthrax attack response simulation. The Objection! simulation (http://www.objection.com/), customizable for any state's legal system, is used in US law schools to teach trial skills and is approved for continuing legal education.
- **Mobile games:** Naismith et al. (2004) use case studies to review how a number of mobile games implement current learning theories. One example is Environmental Detectives (http://education.mit.edu/ar/ed.html), an augmented reality game, in which Grade 5 to 8 students use a constructivist approach, playing the role of environmental engineers searching for data to solve problems related to a toxic chemical spill. Simulation events are triggered by real-world locations as players navigate through a physical space.

Tip

Search the Internet to find examples for your discipline. Some sites to start you off are the FutureLab showcase (http://www.futurelab.org.uk/showcase/show.htm), BBC Schools (http://www.bbc.co.uk/schools/games/), FunBrain.com (http://www.funbrain.com/), and the EDUCAUSE Games and Simulations page (http://www.educause.edu/GamesandSimulations/11263).

What makes a learning game effective?

As with other new learning technologies, it is important to separate hype from reality. Not all game-based learning trials are successful, for reasons related to a game's design, fit with learning objectives, role within the larger learning context, technology support, and other factors. However, experience and research are developing a growing body of knowledge about features and practices that contribute to game-based learning success.

GAME DESIGN

Well-designed learning games aim to achieve engagement levels similar to entertainment games, which keep players involved for many hours of increasingly complex exploration and step-by-step achievement.

Gee (2003, pp. 62–63) argues that "learners must be enticed to try even if afraid, must be enticed to put in lots of effort even if initially not motivated to do so, and must achieve some meaningful success when he or she has expended this effort". He suggests that good video games do this by incorporating the following principles (pp. 137–138):

Table 23.3. Selected Learning Principles in Successful Video Games (Gee, 2003)

Learning Principle	Explanation
Subset principle	Learning even at its start takes place in a (simplified) subset of the real domain.
Incremental principle	Learning situations are ordered in the early stages so that earlier cases lead to generalizations that are fruitful for later cases. Choices in later complex cases are constrained by what the player has found earlier.
Concentrated sample principle	The learner sees and can practise and learn (especially early in the game) many instances of fundamental signs (meanings) and actions.
Bottom-up basic skills principle	Basic skills are discovered bottom up by engaging more and more in the game.
Explicit information on-demand and just-in time	The learner is given explicit information what is needed just at the point where it can best be understood and used in practice.
Discovery principle	Most learning happens through experimentation and discovery rather than through telling.
Transfer principle	Learners are given ample opportunity to practise, as well as support for transferring what they have learned earlier to later problems.

The flow concept offers additional game design help. According to Malone (1980), flow happens in activities in which players can increase or decrease the level of challenge to exactly match their skill levels; they can obtain increasingly complex information through a broad range of challenges, some qualitatively different; they have clear performance criteria and feedback so that they can always tell how well or poorly they are doing; and the activity is free from distracting stimuli that might interfere with their involvement. Evaluating games in terms of flow naturally leads us to look for games with:

- multiple challenge levels that adapt as players learn;
- clear goals and easily interpreted, frequent feedback; and
- a variety of game tasks and activities to avoid the boredom we frequently associate with more traditional learning technologies.

Other features that help to make games engaging (Becta, 2001; Dickey, 2005; Fabricatore, 2000; Mitchell & Savill-Smith, 2004; Prensky, 2001a) include:

- dynamic visuals, interaction, rules and goals (although games can be successful without highly complex virtual reality graphics);
- naturally embedded (rather than external) learning content with contextual relevance;
- simple startup and rules to provide early success and minimize frustration;
- game pace and length matched to the target audience;
- opportunities to exercise the arcade game skills of the "gaming generation";
- opportunities to make many decisions and correct and learn from errors;
- use of first-person point of view, i.e., making the player part of the gaming environment;
- use of narrative (story) to provoke curiosity and give opportunities for creativity, choice and control;
- using physical, temporal, environmental, emotional and ethical dimensions to provide players with a sense of immersion; and
- using compelling characters (or let players create their own) with which players empathize and identify.

Beyond analyzing a game's features, Prensky (2001a) suggests that observing players can help us identify an engaging game:

- Is the game fun enough that someone who is not in its target audience would want to play and learn from it?
- Do people using it think of themselves as "players" rather than "students' or trainees"?
- Is the experience addictive? Do users want to play again and again until they win, and possibly after?
- Are the players' skills in the subject matter and learning content of the game improving at a rapid rate, and getting better the longer he or she plays?
- Does the game encourage reflection about what has been learned?

FIT WITH LEARNING OBJECTIVES

Games can be used to support a variety of learning objectives. Garris et al. (2006) provide a useful review of possible game learning outcomes.

Table 23.4. Game Learning Outcomes (Garris et al., 2006)

Outcome Type	Description
Cognitive	
• Declarative	Knowledge of the facts and data required for task performance
• Procedural	Knowledge about how to perform a task
• Strategic	Ability to apply rules and strategies to general or novel cases
Affective	Beliefs or attitudes regarding an object or activity, e.g., feelings of confidence, self-efficacy, attitudes, preferences, and dispositions
Skill-based	Performance of technical or motor skills

Clearly a key question in selecting or designing a game is how well it fits with the objectives you have in mind. Here are some factors to keep in mind when relating a game to your learning objectives:

- **Cognitive objectives:** Factual knowledge can be readily learned through frame games (e.g., question-and-answer-based Jeopardy, or a Concentration-style matching game) or through solving puzzles (possible with external searching for information) as part of quest games. Simulations or adventure games can require factual knowledge to solve problems or make decisions; procedural and strategic knowledge related to system interactions, as well as problem-solving skills, can also be major simulation game outcomes. In these situations it is important to see that simulation models are realistic and match (or do not conflict with) your objectives in using the game.
- **Affective objectives:** Games are often promoted as vehicles for changing attitudes and beliefs, e.g., when used to teach the importance of diet management for diabetes. How appropriate are the attitudes and beliefs embedded in a game? How appropriate are the implied social attitudes and beliefs, e.g., about violence, gender, race? What attitudes, beliefs, and actions are rewarded?
- **Skill-based objectives:** If your objectives include technical or psychomotor skills (e.g., typing, driving, flying, equipment disassembly and repair), it will be important for you to review any evidence available about how well the skills taught in the game transfer to the real world.
- **Role within the larger learning context:** A game is only one activity in the total learning system. How the game activity is assigned, supported, and debriefed is extremely important in making sure that its full learning potential is realized. Two key ways in which you as an educator can improve the success of your games are through collaboration and reflection.

Finding ways to make game play a collaborative rather than an individual activity adds the impetus of collaborative learning to the activity. In our experience, even simple traditional games such as question-based Tic Tac Toe can become lively shouting matches when teams compete to win. Collaborating on designing a city or roller coaster can lead a group to find and share ideas and knowledge far beyond the capabilities of one individual. Playing an MMOG leads a learner to collaborate spontaneously with others in order to progress in the game (Galarneau, 2005).

Many experts note the importance of reflection—encouraging students to think deeply about, and articulate, the learning that they experience in playing a game. Gee (2003) states the importance of incorporating active and critical thinking about how the learning relates to other semiotic domains. Commercial learning games, particularly for the K–12 age group, are beginning to appear with support materials to help teachers position and facilitate their use and to guide learners in reflecting on what they have learned and how it can be applied outside the game. For an example, see http://www.gamesparentteachers.com.

TECHNOLOGY SUPPORT

As with other learning technologies, technical infrastructure and support can make or break a game-based learning exercise. For an effective experience with your learners, you will need:

- computer and network configurations to support your play plan (individual PCs or handhelds for all, for small groups, or at the front of the classroom; if networked, stable online access with good response times;
- readily available technical support staff if something goes wrong;
- knowledge and experience with the game to answer questions and help learners who run into problems;
- clear navigation and help in the game software; and
- good security (e.g., anti-hacker and privacy guards, particularly when games are used with young children online).

Example

Effective learning games do not always need long story lines or sophisticated virtual worlds. *Education Games Central* games (http://www.savie.qc.ca/carrefourjeux/an/accueil.htm) routinely engage teams of young or older players in spirited competition in many content areas.

Getting started

At this time, games for learning (other than management simulations) are being tested in many interesting examples, but it isn't clear how widely they are being used. Often educators and trainers face obstacles to using computer-based games, including:

- lack of experience and long learning curves;
- time and costs required for custom game development and implementation;

- poor technology support for classroom-based game use; and
- institutional constraints (learning objective mismatches, standardized fact-based testing, class time constraints, lack of peer acceptance, etc.).

Prensky (2006) notes that curriculum requirements, especially when mandated through legislation, can pose a major obstacle, although "curricular" games are starting to be produced commercially. To overcome this and other obstacles, he suggests the following approaches to beginning to use games in class that ease games into your learning situation without major course restructuring:

- Bring games played outside class into the classroom through questions, discussions, etc. This can encourage students to reflect on how a game is relevant to a topic and what they are learning from the game. Make game play an assignment for individuals or small groups.
- Use the principles behind good, complex games to make some or all of your teaching more game-like, and therefore more interesting and engaging to students. One of Prensky's suggestions for keeping students engaged is to have them vote each time you ask a question.
- Play a game specifically designed for education in class, such as one of the examples cited above. To do this, you need to become quite familiar with the game in order to handle questions and technical problems.
- Play a commercial, off-the-shelf game not specifically designed for education, in class, either as a whole class (projected in the front) or as individual students playing separately. Have a student present the game, play the game yourself in front of the class as a springboard to discussion, or divide the students into small groups.

Creating your own game

If you decide to go beyond these options to create your own game, here are some possible approaches:

- **Use a frame game:** Frame games, such as the Educational Games Central ones described above, lend themselves to use, even for complex subjects, without a long learning curve if you can structure your learning in a question-and-answer format. To give an example, the EGC Snakes and Ladders frame game has been used to reinforce introductory social psychology concepts.
- **Do a COTS game modification:** Some commercial games, especially first-person shooters, real-time strategy games, and MMOGs, provide toolkits that let you create "mods" including your own graphics, game scenarios and characters. In one example, the MIT Education Arcade project "modded" the game NeverWinterNights, which comes with the Aurora Toolset game-editing tool, to create the Revolution game (http://www.educationarcade.org/revolution) to teach about the American Revolution seen from Colonial Williamsburg. Another mod of NeverWinterNights, Project BTM, was developed at the University of Minnesota to teach information-gathering stages to journalism students (Paul et al., 2005).
- **Get help to custom-build a learning game:** Many universities and technical schools have game studies programs with students who are looking for projects or work designing and building games using current tools and techniques. You may also be able to find funding for research or learning object development. For example, computer science students at Dalhousie University are working with physicians to build handheld and cell phone game prototypes to help local children learn about and manage chronic diseases (Watters et al., 2006).
- **Create a blended game with computer support:** If building a full-scale computer-based game seems too daunting, you can consider a game that uses computers or handhelds to support a game that also involves offline activities. The MobileGame, for instance, uses task instructions and clues delivered by cell phone to run an orientation game introducing new students to a university campus (Schwabe and Göth, 2005).

Tip
Match your first project with your experience, learner characteristics, and available technology, technology support, and development resources. To build institutional support, aim for early successes before embarking on a large, longer-term project.

Summary

"Our students have changed radically. Today's students are not the people our educational system was designed to teach … Our Digital Immigrant instructors … are struggling to teach a population that speaks an entirely new language". – Prensky (2001b)

In the spirit of introducing the new language of games for learning, this chapter has reviewed basic terms, the motivation to use games for learning, examples to fire your own imagination, factors that make learning games effective, and guidelines for getting started successfully. We hope that this brief introduction has sparked your ideas and your desire to learn more about using computer-based games for learning in your context. Our references and the websites listed in this chapter are a good place to start, and your own searches will provide you with more information. We wish you great success as you explore this intriguing and promising area!

Glossary

Avatar. An image (created or selected and often customized as a fantasy figure) that represents a player in a shared virtual environment.

COTS game. Commercial off-the-shelf game.

Flow. An experience of full immersion, active involvement, and success in an activity.

Frame game. A game structure or template into which content is inserted to create a game.

Game. A set of activities with goals, rules, and competition (possibly with oneself) that involve one or more players in an artificial situation.

Massively multiplayer online game (MMOG). A game played on the Internet, typically in a persistent world, that is able to include hundreds of thousands of players.

Semiotic domain (as defined by Gee (2003)**.** A set of artifacts (words, gestures, images, sounds, that can take on meaning in shared contexts and communities.

Simulation. A dynamic, simplified but accurate systems model of aspects of reality.

Simulation game. An activity that involves aspects of games (goals, rules, and competition) within a simulation model.

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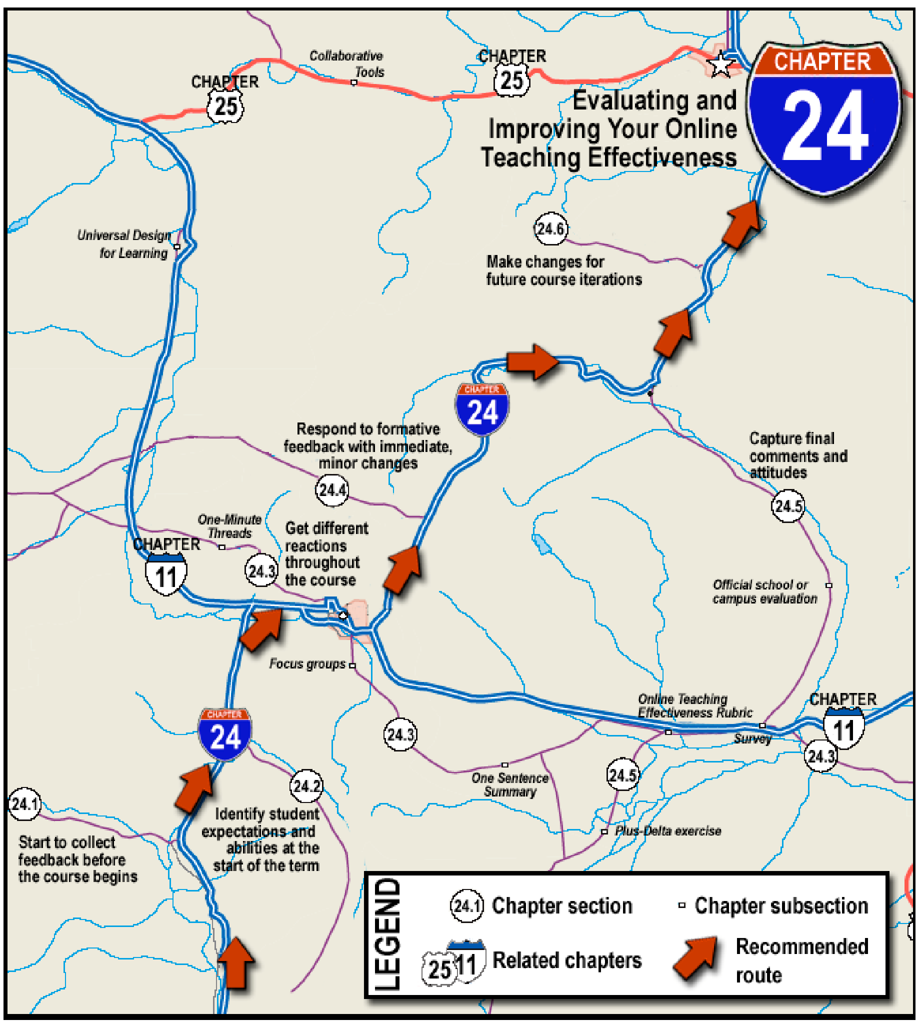
24
Evaluating and Improving Your Online Teaching Effectiveness

Kevin Kelly

Indeed, my argument is that every course is inherently an investigation, an experiment, a journey motivated by purpose and beset by uncertainty. A course, therefore, in its design, enactment, and analysis, is as much an act of inquiry and invention as any other activity more traditionally called "research" or the scholarship of discovery. – Schulman (1998)



Learning outcomes

After completing this chapter, you will be able to:

- Collect direct and indirect feedback from peers and students about online teaching effectiveness before, during, and after the course.
- Use this feedback to make changes to your online course or course environment, both during the course and for future iterations.

Introduction

Teaching effectiveness describes instructors' ability to affect student success. It is usually defined according to several factors, such as how well instructors organize courses, how well they know the course material, how clearly they communicate with students, how frequently they provide timely feedback, and other criteria. In the classroom, effectiveness sometimes depends on the instructor's enthusiasm or disposition. During fully online and blended learning courses, students often need more structure and support to succeed because their course activities usually require them to take greater responsibility for their own learning success. Therefore, many of the criteria take on even more importance when evaluating online teaching effectiveness.

Online teaching is often held to higher standards than classroom teaching, and sometimes these standards have nothing to do with the teacher's ability. For example, a technological breakdown can have a negative impact on students' evaluation of an instructor's work, though the instructor is rarely responsible for the technical failure.

To succeed, you should find some allies to help. If you are new to online teaching and learning, let your students know. They will usually give you a lot of leeway. Some of the students may offer to help you set up or facilitate technology-based activities or at least respond positively to your requests for technological help. Overall, you will find it well worth the effort to evaluate and improve your online teaching effectiveness.

There are many ways to evaluate teaching effectiveness in either the physical or virtual environments. Getting pointers and advice before the term begins can save you from making revisions later. Formative feedback, collected during an ongoing course, improves that specific course. Summative feedback, collected after a course ends, improves the next iterations. Feedback that applies to the instructor's process can also improve other courses.

In this chapter, I discuss seeking feedback from peer instructors, distance education practitioners, students, and even yourself. If you teach fully online, you should be able to convert any face-to-face feedback strategy to the online environment, even if I do not specifically point out how to do it.

Collect feedback before the course begins

Few people are born with an innate ability to teach effectively online. If you have not taught online before, it is a good idea to take a workshop, or to work with someone to plan or create the online environment. If you have just begun the process, you can also explore free online workshops, such as:

- Penn State's "Faculty Development 101," designed for beginning distance education faculty (https://courses.worldcampus.psu.edu/facdev101/student/index.shtml).
- Arizona State University's "Crash Course in Online Teaching: Online Instructors as Online Students," which includes hands-on workshops and self-paced tutorials (http://www.ipfw.edu/as/tohe/2003/papers/VanHorne.htm).

Ask a peer to let you review an online course to see what you like or do not like about how it is constructed, how the instructor(s) provide feedback, how students are assessed, and so on. If you are inheriting an online course from someone else, try to get feedback about what has already been done. Before your course begins, you should ask a peer to tell you about how appropriate the learning objectives are for the topics, as you might do for a face-to-face course.

Depending on your school district or campus, seek additional people who might provide comprehensive feedback in a faculty development centre or an academic technology unit. You might also try to find a fellow teacher who has supplemented face-to-face instruction, taught a hybrid course, or taught a fully online course. Even if this person works in a different department or unit, it is helpful to share your online teaching experiences with someone who has gone through the process.

If this is your first time teaching an online course, or using online components for your face-to-face or hybrid course, you do not have to use every online tool or strategy. Instead, choose one or two strategies based on your learning objectives

Writing personal teaching goals is one more practice you can try as you prepare the online environment and the materials and activities to go in it. Creating an online teaching journal allows you to track your thoughts and actions over time. Including personal teaching goals among the first entries will get you off to a good beginning.

Identifying student expectations and abilities

Involve students in the teaching and learning process from the start. Students who take part in this process often become more engaged in the course itself. Let them know what you will be doing and how you will be doing it throughout the term. Tell them if you are new to online teaching. At the beginning of each term, I ask students to tell me what they expect from the course, beyond the learning objectives in the syllabus. I will revisit these student expectations later, when I get to creating and using **mid-semester evaluation** surveys.

If you want to include students in the entire evaluation process, ask them to help create an effectiveness **rubric** before the course begins. First, tell them the criteria for which you specifically want their feedback. Then ask them how they define online teaching effectiveness. Not only do they have to generate the criteria, they also have to agree on the range that defines how well you meet the criteria. Make sure to provide examples so they can see what typical ranges look like. Let them know up front how many student-defined criteria will go into the rubric. If that number is five, for example, then they can generate as many ideas as they want before voting on the top five. This exercise can be done in small groups or as a whole class, either face-to-face or online.

To prepare for collecting indirect feedback throughout the course, create a benchmark by asking students to perform certain activities at the beginning. For example, ask students to take a small quiz, define common vocabulary, or other minor tasks. In the first week of the course, this activity is not worth any points, though you can assign points to motivate students to complete the activity. Later in the term, you can ask the students to perform the same activity to see how well they are meeting the course objectives or how well they are learning certain material.

Finally, you can improve teaching effectiveness by increasing students' responsibility for their own learning. Ask students to take a **learning preferences** survey, such as the Index of Learning Styles created by Richard Felder and Barbara Soloman (find the survey itself and descriptions of learning styles at http://www.ncsu.edu/felder-public/ILSpage.html). Then direct them to turn in the results to you. This will give you ideas about providing multiple pathways for students to learn the same knowledge, skills or attitudes. By considering the student-centred approach, you will improve your teaching effectiveness in the online environment.

Getting different reactions throughout the course

You can conduct formative feedback for a number of reasons: to check how things are going at a certain point; to evaluate the effectiveness of a specific assignment or resource; or to gauge student attitudes. The frequency with which instructors obtain feedback can range from once per session to once in the middle of the term. Direct methods to collect formative feedback include, but are not limited to, the following:

PEER REVIEW AND SELF-EVALUATION

As important as student engagement can be, student evaluations by themselves are not sufficient. Solicit peer review of specific resources, activities, or assessment strategies, your course structure, your communication strategies, or anything else about which you might have concerns. If you cannot find anyone in your school, department or college who is also teaching online you can ask school or district administrators, academic technology staff members, or faculty development centre staff members to identify prospective peer mentors for this type of feedback. In some cases, the staff members themselves may be able to help you as well.

Another strategy is to create benchmarks for yourself and take time each week to see how you are doing. For example, if you set a goal to answer a certain number of discussion threads in a particular forum, keep track of how many replies you submit, and make adjustments. If you want to return all students' written assignments in a certain amount of time, note how many you were able to complete within your self-imposed deadline. This will help you create more realistic expectations for yourself for future assignments.

ONLINE SUGGESTION BOX

Online suggestion boxes are unstructured activities that capture voluntary comments at irregular intervals throughout an entire term. You can use email or a threaded discussion forum for this activity. If you use a discussion forum, let students know if their contributions will be graded or non-graded. In some Learning Management System (LMS) solutions, you can allow anonymous comments. Tell students that you will allow anonymous comments as long as they remain constructive. You could make it a portion of a participation grade to enter a certain number of suggestions throughout the term. To focus their comments, give a list of items about which you want feedback, such as amount of respect shown to students and their ideas, variety of avenues to reach learning objectives, amount of feedback provided, relevance of coursework to the world, communication practices, or willingness to make changes based on student feedback. If it is a hybrid or face-to-face course, bring the suggestions back to the classroom and announce them in front of the class, so that students know their ideas have been heard and are being addressed.

ONE-MINUTE THREADS

Normally used as a classroom assessment technique (CAT), **one-minute papers** ask students to write three things in one minute:

- what they felt was clear, helpful, or most meaningful from a course reading, lecture, or classroom meeting;
- what they felt was "muddy," unclear, or least meaningful from a course reading, lecture, or classroom meeting; and
- any additional comments.

With only a minute to write these three things, students provide short, concentrated answers rather than lengthy passages. This makes it easier to see what works and what does not. For example, a biology student might write "clear—basic cell structure," "unclear—4 phases of mitosis / cell division," and "comment—please show more animations and pictures … they help." This process can be anonymous or not, depending on how you plan to use the results. Angelo and Cross (1993) explain the concept of the one-minute paper in their book about CATs, while Chizmar & Ostrosky (1998) cover its benefits in detail.

In the classroom setting, the instructor collects all of the papers and looks for patterns, or areas that are clear or unclear to several students. With this information, they can address problem areas at the beginning of the next class meeting before moving to new material. To respond to less common comments, the instructor may opt to post additional resources, such as journal articles or links to websites that cover a problem area in more depth or from another perspective. Instead of covering the less common problems in class, the instructor has the option of providing more materials related to specific areas, and being open to additional questions.

I began asking students to go through the one-minute paper exercise in an online discussion forum when several international students asked for more time to think about what they did not understand. Writing their thoughts right at the end of the class meeting did not give them a chance to digest what we had done. They wanted to go over their notes from the face-to-face class, to translate any unfamiliar terms and ideas, and sometimes even to discuss the concepts in a small group. By going online, they could have more time to process their thoughts and still give me feedback before the next class meeting.

This new practice turned out to benefit everyone. (See the section on Universal Design for Learning in Chapter 11, Accessibility and Universal Design.) Instead of waiting until the next class period to respond to student needs, I could use the discussion forum to answer each student's question fairly quickly. After only two weeks, something amazing happened. Without prompting, students began answering each other's questions before I had a chance to reply. An online community had formed around a classroom assessment technique that is traditionally not such an open process, being facilitated by the instructor alone. To note the difference, I have started calling this exercise "**one-minute threads**," encouraging students to help each other from the beginning.

Tip

When creating the settings for a "one-minute threads" discussion forum, do not allow students to post their own original threads or discussion topics. Otherwise, the threads will be hard to sort, since they may not have clear subject lines, and will be added in a fairly random order. Instead, ask them to reply to three specific questions (clearest point, muddiest point, and additional comments). This organizes the responses for you. If your LMS or other discussion forum engine does not allow this, write clear instructions for giving the specific responses you are trying to elicit.

Figure 24.1 shows an example discussion forum, demonstrating how requiring students to reply to the instructor's threads will organize the information for you. For the muddiest point, you can see that the instructor has replied to each student individually. Under "Additional comments," you can see that some students have responded to each other.

Clearest point	Instructor	29 Feb – 23:57
This week's topic—clear	Student A	01 Mar – 06:15
Re: Clearest point	Student H	02 Mar – 14:34
Information that was meaningful to me	Student B	04 Mar – 10:08
…	…	…
Muddiest point	Instructor	29 Feb – 23:59
Re: Muddiest point	Student G	01 Mar – 09:49
Re: Re: Muddiest point	Instructor	03 Mar – 20:10
Unclear on the concept	Student K	02 Mar – 22:01
Re: Unclear on the concept	Instructor	03 Mar – 20:22
This week's topic—unclear	Student A	04 Mar – 06:30
Re: This week's topic—unclear	Instructor	05 Mar – 19:38
…	…	…
Additional comments	Instructor	01 Mar – 00:04
Suggestion about reading	Student D	01 Mar – 07:51
Good suggestion!	Student C	01 Mar – 09:22
Re: Additional comments	Student C	01 Mar – 09:15
Similar idea for reading assignment	Student A	04 Mar – 06:44
Additional comments	Student N	03 Mar – 13:55
This week's topic—comments	Student A	04 Mar – 06:37
…	…	…

Figure 24.1 Example discussion forum

POLLING

There are various online polling tools that allow you to get small amounts of feedback in a short time. Some of these polling tools are built into LMS solutions, such as Moodle's Choice module, allowing instructors to ask single questions related to the material, a course reading, or instructional practice.

FOCUS GROUP

Ask a small group of students to join you once a month, either physically (e.g., office hours) or virtually (e.g., chat, discussion forum). These could be the same students for the entire term or a new group of students each time. During your meeting, ask them specific questions to determine information about learning objectives, resources and how they are organized, online activities, assessment strategies, amount of feedback, or other aspects of your teaching that you want to improve.

Tip

The students are more likely to respond honestly if their comments are anonymous. In this case, you might assign someone from the small group to ask the questions, another to keep track of time, and a third person to take notes that they post as a group or send by email. Most LMS chat tools do not allow students to block the instructor from seeing the archive, so you may have to disable the archive for that chat, if possible. The note taker can copy and paste the entire chat into a word processing document for summarizing, editing, and removing student's names. Other options include telling the students to use a free Instant Messenger (IM) service to hold the chat session outside the online environment for the course.

MID-SEMESTER EVALUATION SURVEY

If you would prefer a larger scale approach than a focus group, try a mid-semester survey. I have used different tools, two of which allowed anonymous student responses, but there are several more. Those that I have used are called the Free Assessment Summary Tool (FAST—http://www.getfast.ca) and survey tools within LMS solutions, such as Blackboard's Survey Manager, WebCT's Quiz and Survey module, and Moodle's Survey module or Questionnaire module.

While it is not perfect, I like FAST for several reasons:

- It is free.
- Anyone can use it to create surveys. It does not require that your campus have a LMS.

- Student responses are anonymous. In addition the survey is conducted in a password- protected environment, so you can be reasonably sure no one who is not enrolled in your course is critiquing your work.
- It provides a question database with more than 350 survey questions related to different aspects of teaching effectiveness. These questions are organized into 34 categories such as Assignments, Enthusiasm, Feedback, Instructor Content Knowledge, Learning Environment, and Student/Student Interaction. You can choose questions from the database, or make your own questions, or both.
- Instructors can download the results as a Microsoft Excel file.

Figure 24.2 contains five items from the anonymous, twenty-question survey I conduct each semester using FAST. The first set of ten questions relate to the student expectations that they define during the first week of the term. The second set of ten questions relate to different elements of teaching effectiveness that I want to improve. Sixteen out of twenty-one graduate students responded.

For my survey, I choose the "Likert Scale & Long Answer" option for each question. That way I can get quantitative data, numbers that quickly tell me what students like or do not like, and qualitative data, written comments that, I hope, will tell me how to improve different parts of my class. Here are some example responses for Question 5, "In this course, I am getting hands-on skills":

- "I agree that I am getting hands on skills, or that theoretically I am. I think that having a client in the immediate area or available to talk to the students on an ongoing basis would be better than allowing a client to communicate solely by email and at their discretion. A contract drafted by the two parties would be desirable when going forward".
- "Kevin brings in great examples. I feel that a day of lecture on starting and finishing a needs assessment may be helpful to anchor the learning a bit. I am really working with clients".
- "Yes, in the sense that I am working on all the steps with my group mates, but I wonder how I would do outside the context of this class …".

ONLINE TEACHING EFFECTIVENESS RUBRIC

If you take the time to create a rubric with your students at the beginning of the semester, then you have to use it some time! This might also be a mid-semester event (in lieu of a survey), or you might ask different teams to complete the rubric at different times. In this way, each student might only complete it once, but you will get feedback once a month or even more frequently. Later I will talk about addressing the students' feedback, both individually and as an entire class. If you choose to use a rubric, make sure to leave time to explain the concept to the students. Going over the results will take longer than an online survey, but the qualitative data provides much more value than survey results alone.

Figure 24.3 contains some example criteria from a rubric that my students and I created together. Notice how the range for evaluating each criterion can be qualitative or quantitative in nature. Also, it is important to provide space for written comments so students can suggest ways to improve.

You do not always have to ask, "How am I doing?" to evaluate online teaching effectiveness. You can also use indirect methods to collect formative feedback. These indirect methods include, but are not limited to, the following.

One-sentence summary

The **one-sentence summary** is another classroom assessment technique that I adapt to the online environment. Designed to elicit higher level thinking, a one-sentence summary demonstrates whether or not students are able to synthesize a process or concept. Students answer seven questions separately: "Who? Does What? To Whom (or What)? When? Where? How? and Why?" Then they put those answers together into one sentence. Angelo and Cross (1993) also describe this exercise in their book about classroom assessment techniques. Examples I have seen include assigning nursing students to write a one-sentence summary of a mock patient's case, as nurses are often required to give a quick synopsis about each patient, and asking engineering students to write a summary about fluid dynamics in a given situation.

It is fairly easy to use this technique online. You can set up a discussion forum to collect the student entries. The online environment also makes it fairly easy to engage students in a peer review process and to provide timely feedback.

When looking at the results of the students' summaries, you can identify areas where large numbers of students did not demonstrate an understanding of the topic or concept. The most common problem area for students revolves around the question "Why?" Figure 19.4 is an example of a one-sentence summary submitted via discussion thread. The instructor's reply gives suggestions for improvement and shows the student how the instructor interpreted the sentence components.

Student-generated test questions

Ask students to create three to five test questions each. Tell them that you will use a certain number of those questions on the actual test. By doing this, you get the benefit of seeing the course content that the students think is important compared to the content that you think they should focus on. You can make revisions to your presentations to address areas that students did not cover in their questions. If there are enough good student questions you can also use some for test review exercises.

Questions	Strongly Disagree	Somewhat Disagree	Not Applicable	Somewhat Agree	Strongly Agree
Q1. In this course, I have had a chance to work on a meaningful needs assessment project.	1	1	1	9	4
Q2. In this course, I am getting good experience with the needs assessment process.	1	1	0	11	3
Q3. In this course, I am getting appropriate practice working with clients.	3	0	1	9	3
Q4. In this course, I have learned to develop an instrument that allows me to determine the client's needs.	0	1	1	10	4
Q5. In this course, I am getting hands-on skills.	0	0	0	12	4

Figure 24.2 Example survey results

<table>
<tr><th>Category</th><th>4</th><th>3</th><th>2</th><th>1</th></tr>
<tr><td rowspan="2">Organization</td><td>Course is very organized, making it easy to find all materials and assignments</td><td>Course is fairly well organized, requiring a little effort to find some materials and assignments</td><td>Course is somewhat organized, making it a challenge to find most materials and assignments</td><td>Course is convoluted, making it very difficult to find any materials or assignments</td></tr>
<tr><td colspan="4">Score:
Comments:</td></tr>
<tr><td rowspan="2">Assignments</td><td>Course assignments are very appropriate to the topic of study</td><td>Course assignments are fairly appropriate to the topic of study</td><td>Course assignments are only somewhat appropriate to the topic of study</td><td>Course assignments are not appropriate to the topic of study</td></tr>
<tr><td colspan="4">Score:
Comments:</td></tr>
<tr><td rowspan="2">Meeting Student Needs</td><td>Instructor related all subject matter (all 10 core topics) to student interests and experiences.</td><td>Instructor relates most subject matter (6 to 9 core topics) to student interests and experiences</td><td>Instructor relates some subject matter (4 to 6 core topics) to student interests and experiences</td><td>Instructor relates very little subject matter (0 to 3 core topics) to student interests and experiences</td></tr>
<tr><td colspan="4">Score:
Comments:</td></tr>
</table>

Figure 24.3 Example rubric criteria with evaluation ranges

My Sentence
by Student B—Friday, 2 September, 12:35 PM

In order to adequately address teaching effectiveness an instructor needs to use an effective tool to measure specific activities or deficiencies in student performance by using techniques including but not limited to: surveys, analysis of performance, and questionnaires.

> Re: My Sentence
> by Instructor—Sunday, 4 September, 08:31 PM
>
> This is a good start. WHEN does it happen? Keep in mind that the process does not end with using a data collection tool. There is analysis of the process before the course begins, and after collecting the data. Also, WHERE does it happen? Is this online, in the classroom, or both?
> -----
> In order to adequately address teaching effectiveness [7 WHY] an instructor [1 WHO] needs to use an effective tool to measure specific activities or deficiencies [2 DOES WHAT] in student performance [3 TO WHOM] by using techniques including but not limited to: surveys, analysis of performance, and questionnaires [6 HOW].

Figure 24.4 Example one-sentence summary student submission with instructor's reply

Evaluate online quiz or test results

If you use a learning management system (LMS), an online workbook environment that comes with publisher materials, or other online space that allows online quizzes or tests, then you can use the results to identify problem areas. LMS solutions like Moodle and ANGEL provide tools to perform an item-by-item analysis to evaluate several factors related to individual questions. These factors include item facility, an indicator of the question difficulty for students; standard deviation of student responses on each question; and item discrimination, an indicator of the difference between performance by high-scoring students and low-scoring students.

Even if you can only get simple statistics, such as how the class answered each question overall (e.g., 10 percent picked "A," 25 percent picked "B," 65 percent picked "C"), you can use this information to make adjustments. One way to do this is to ask your students to take a pretest or baseline quiz at the beginning of the course, and then compare those results to the actual quiz results. In face-to-face or hybrid course situations, you can use the quiz results to address issues through quiz reviews or changes in your lecture. Dr. Karen Grove from San Francisco State University discusses how to use quiz results to address learning gaps via a student preparation module in the Orientation to College Teaching (http://oct.sfsu.edu/implementation/studentprep/index.html). If large numbers of the students get a question wrong, the instructor can cover that topic more fully. The instructor can also dispel misconceptions after seeing how many students choose a particular incorrect answer. Figure 19.5 is a sample of item analysis in the Moodle LMS (version 1.5.4). Figure 19.6 is an example of much simpler item statistics in the Blackboard LMS (version 6.2). The instructor can see how many people select each answer. For essay questions, it provides a complete list of all the essays.

Responding to formative feedback with immediate, minor changes

Collecting the student feedback is just the beginning. However, you do not have to, and should not, wait until the end of the term to start introducing changes as a result of what you learn from the students. For instance, students may use the different instruments to ask you to be more flexible in the teaching approach, to maintain a good attitude towards students and their ideas, to use more appropriate assessment methods, or to add more real-world application to the content.

To continue engaging students in the process, go over the formative feedback results with them and solicit suggestions for changes. I tell my students that, to me, "constructive criticism" means that they must help construct solutions to problems or issues that they find. Together, the students and I look at survey results or rubric scores, and any comments about a specific teaching effectiveness criterion. If no comments address how I can change to meet their needs, then I ask them to give me suggestions. In one case, the students stated that I sometimes used terms from the field that were not used or defined in the readings. The short-term solution was to create a short vocabulary list for each unit, based on both experiences and readings. I chose to do this myself, but I could have involved the students even further by having the class generate vocabulary lists for each unit, based on words that each student had to look up individually.

Students may ask you to do a number of things related to the course or how it is set up:

- To clarify your expectations, update your course objectives, create more detailed instructions for assignments, or identify how students will be evaluated for each learning objective more clearly.
- To improve the online course structure or organization, consolidate all resources, activities, and assessment strategies related to each learning objective.
- To show more knowledge of the course material, create and upload recorded lectures, upload your presentations, and provide information about any research that you have done related to the course content.
- To increase the variety of avenues for students to reach learning objectives, provide resources in different formats (e.g., video clips, text readings, charts and graphs) and encourage students to demonstrate knowledge or skills in different ways, if possible (also see Chapter 11, Accessibility and Universal Design).
- To provide more opportunities for active learning, create small group discussions around materials or assignments, use collaborative tools such as wikis (see Chapter 25, Tools for Engagement and Collaboration), and assign students to online study groups.
- To show the relevance of coursework to the world, assign students to relate course content to current news, provide examples of current research in the field (e.g., published articles) as optional readings, and invite experts in the field to participate in online activities such as discussion forums.

Question text	Answer's text	partial credit	R. Counts	R.%	% Correct Facility	SD	Disc. Index	Disc. Coeff.
There are many ways to evaluate online teaching effectiveness throughout the course.	True	(1.00)	28/32	88%	88%	0.35	0.83	0.57
	False	(0.00)	4/32	13%				

Figure 24.5 Moodle LMS item analysis

Question 4 Multiple Answer		Average Score X points	
Which of the following are formative feedback techniques for evaluating online teaching effectiveness?			
Correct	**Answers**	**Percent Correct**	**Percent Incorrect**
X	Online teaching effectiveness rubric	94.117645%	5.882353%
X	Mid-semester evaluation survey	88.2353%	11.764706%
	Ouija board	94.117645%	5.882353%
X	Focus group	70.588234%	29.411766%
	One-hour threads	50%	50%

Figure 24.6 Blackboard LMS item statistics

Students may also ask you to change how you facilitate different online course components:

- To improve communication with students, put clear deadlines and policies (e.g., late submissions) in your syllabus, but let students know that you will vary online components to meet their needs,
- To provide timely, appropriate feedback, give yourself grading deadlines and use short rubrics that tell students why their work is good or needs improvement.
- To demonstrate how enthusiastic or approachable you are, hold virtual office hours and encourage students to contact you for help.
- Demonstrate your willingness to make changes based on student feedback, outline your feedback process for students, tell students directly that you will make reasonable changes that will improve student learning, and let them know what changes you make, along with the rationale for each change.
- To show respect to students and their ideas, acknowledge student viewpoints even if they contrast with your own, and bring good ideas to the attention of the other students, even if you do not name students specifically.
- To create and maintain a safe environment for expression, include a "Netiquette" policy in your syllabus, model the types of responses that you want students to employ, enforce your policies when students do not follow them (also see Chapter 26, Techno Expression).

To close student performance gaps identified by indirect feedback methods, you can provide extra resources (e.g., websites, articles, or additional attention during face-to-face lectures or online recorded lectures), extra activities (e.g., self-assessment quizzes, discussion forums, wikis), or both.

Capturing final comments and attitudes

Conduct summative feedback for a number of reasons: to check how things went, to evaluate the effectiveness of a specific assignment or resource, or to gauge student attitudes about the course as a whole. The summative feedback will be a useful set of data for course redesign. While the current students will not benefit from any changes you make, future students will have a better experience.

ONLINE SURVEY

Similar to the formative feedback surveys, you can use a closing survey to find out what students feel about specific aspects of your online teaching or their overall experience. There are numerous survey tools out there. Some are stand-alone, online survey tools and some are integrated into learning management systems.

PLUS/DELTA EXERCISE

This group exercise is used in a variety of settings: corporate meetings, training workshops, closing sessions at conferences, and, of course, K-16 classrooms. The purpose is to identify publicly what people think about a particular shared experience. The name "plus/delta" comes from the two symbols—plus (+), signifying positive aspects of the experience, and delta (Δ), signifying aspects that people would change—that sit atop two blank columns. In a group setting, participants then add items to each column. Some facilitators will give each person a chance to either add an item or pass, while others go with a looser approach, letting people call out items while they write them down in the correct column. Usually this is done with large pieces of paper on an easel or taped to the wall, so everyone in the room can see the growing lists.

After participating in several **plus/delta exercises** during collaborative conference sessions, I decided to facilitate one for my graduate practicum course about needs assessment. In this sixteen-week hybrid course, students conduct needs assessment activities for real-world clients in corporate, higher education, K–12 education and non-profit settings. Since the lists are supposed to be compiled publicly, I used Microsoft Word on a computer hooked up to a projector instead of using a chart board or butcher paper. That way I could post the final product online for reference later. If you are teaching a fully online course, or a hybrid course, you can have students provide the same information using a threaded discussion. Next time, I will conduct it as a discussion forum or wiki, rather than in the classroom.

Figure 24.7 contains the actual plus/delta items from the exercise that I conducted with my students at the last face-to-face meeting of our class on needs assessment. You can see the wide range of things that students liked and would like to change. You can also see that the "Delta," or change request, list is longer. When I teach this course again in the fall, I will make quite a few changes!

Plus (+)	Delta (Δ)
• Having no synchronous activities online was helpful • Structure of discussion assignments worked well • Liked using Moodle • Online discussion with consultant was great • Democratic approach—liked having options such as voting on class meeting time • Real-life experience was helpful • Breadth of projects was helpful, allowed people to get involved in a project that interested them • Teams bring people together from wide-ranging backgrounds with different perspectives for project • Rubrics are really helpful • Good takeaway tools • Parties are good • Balance between face-to-face and online was just right	• Check in points—instructor check in with teams • Set deadline for when you can switch project if client is not responding (panic button) • Would like to have a contract with clients • Have some synchronous activities • Do not be as flexible with submission timelines • Repeatedly returning to Moodle was difficult • Moodle is not standardized throughout department • Would like more examples of needs assessments from different industries • More subject matter experts (more consultants) • Have class build case study library as assignments • Handout/link overload, maybe make a centralized place for links • Embed syllabus in Moodle itself (copy syllabus page into each topic area) • Move teamwork exercise to 3rd or 4th week • Move project management exercise earlier to create some sort of blueprint—rotate roles for each stage of project • Get feedback on individual assignments to students earlier • Give assignments to write brief description about how online meeting went

Figure 24.7 Example plus-delta items generated by students in hybrid course

ONLINE TEACHING EFFECTIVENESS RUBRIC

You may use the same rubric—possibly created along with the students—at the end of the term, as you did at the beginning and/or middle.

OFFICIAL SCHOOL OR CAMPUS EVALUATION

You can use the official evaluation provided by the school or campus. Students are very familiar with this evaluation, so ask them to take it seriously. If you are teaching an online course, check if your campus or school has a way to distribute the evaluation form. If not, copy the questions and conduct it yourself using one of the techniques described above. In some cases, instructors can add questions to gather data about specific teaching practices. Use this opportunity to learn how students feel overall about the experience; how they feel about specific content, activities, or assessment strategies; or how they feel about your teaching. If the official course evaluation is conducted online, then you will be able to code the qualitative comments to find common student likes and dislikes.

Throughout the chapter, I have been telling you how supportive students can be. However, some students turn **summative evaluations** into venting sessions, stating that "the instructor should never be allowed to teach online again … ever" or "this was the worst class I have ever taken." There are any number of reasons why a student might do this: anger at him or herself for not performing up to his or her standards, frustration with frequent or high-impact technology failures, infrequent instructor feedback, or other things. Whether or not the harsh criticism is justified, it is usually not accompanied by constructive comments. Despite our best efforts, it can also be really hard to read. Remember that a vocal minority does not constitute the entire class. Focus on the students who do provide real suggestions for change, and use those as the basis for your next try. Talk to your peers about the negative responses while reviewing your course environment. Your peers might be able to make suggestions that the students did not make. Lastly, use one or two of the formative feedback suggestions above to make sure that students do not go an entire semester without an opportunity to tell you how they feel.

Making changes for the future

Once you have the summative feedback, you can let it sit for a while, or immediately begin revising the online course for the next iteration. Changes might include being more flexible in the teaching approach, having a better attitude towards students and their ideas, using more appropriate assessment methods, adding more real-world applications, and so on. Since the new students most likely did not see the previous version of the course, you are free to do anything, from making minor changes here and there to completely starting over. Usually it is somewhere between the two.

In one personal example, using the Moodle Glossary tool, I will revise the short-term vocabulary list solution, described above, to be a communal glossary assignment. Each week I will ask the students to generate glossary terms that they do not understand from my lectures and from the readings. If multiple people add the same term, then I will know it is a concept that requires more attention. Other LMS solutions, like WebCT, have a Glossary tool as well.

Most importantly, do try again. Regardless of how you feel about your first attempt at online teaching, it will get better each time you try. Online course offerings provide students with more flexibility. Hybrid, or blended learning, courses can combine the best of both worlds. Online environments that supplement fully face-to-face instruction can help students to stay on task, to plan ahead, to access resources at any time of day, and more. In all three types of online learning, the pros outweigh the cons. Most students will appreciate your efforts, which is a good thing to remember if you ever question why you are teaching online in the first place.

Summary

> "The educational value of war stories has been grossly underestimated". – Schank & Cleary (1995)

Maintain your sanity by keeping the short-term solutions on a small scale. Unless it is based on feedback given before the course, or right after it begins, it is a good idea to wait until after the course is over to institute a major revision. If there is a good reason to make a major change, communicate clearly and often with your students about what is going to happen and how it might affect them.

I hope I have given you a wide array of possibilities that will help you evaluate and improve your online teaching effectiveness. Do not feel like you have to do everything listed in this chapter! Treat this chapter like a buffet that is open all day, every day. You can put as many, or as few, items on your plate as you like. You can always come back for more. You should chat with other instructors at the buffet to see what they liked and did not like. When you sit down at the table with your peers, take a look at what they are doing and tell them about how your own choices worked for you.

If I rename the modified classroom assessment techniques as "online assessment techniques," then I say "It's always a good time to sow your OATs!" This is corny, I know, but it leads me to my last bit of advice: Keep your sense of humour. At times, it can be tough to go through the online teaching process, to hear or read student criticism, and to make adjustments to your carefully planned course. If you can laugh at yourself and remember that the students are on your side, then you are on your way to teaching effectively online.

Glossary

Formative evaluation. An ongoing process used to determine the relative success of an activity or course at specific points throughout the activity or course.

Learning preferences. Items used in the metacognitive process—learners learning about their own learning process in order to improve learning success. Learning preferences are often broken into categories (e.g., sensory input, perception, organization, processing, understanding) to enable comparisons and to make it easier for learners to associate with one or more in each category. Some learning preferences are also called "learning styles." Learning preferences can also include attitudinal, social, environmental, and physical preferences, as well as brain hemisphere dominance.

Mid-semester evaluation. An activity designed to give formative feedback to the instructor, with enough time to make minor changes or improvements to the course that will improve the chances of learning success for current students.

One-minute paper. An activity used to collect participants' reactions to a reading, event, or activity.

One-minute thread. An online activity based on the principles of the one-minute paper. Variations include allowing students to give feedback to one another about what some students did not understand. This feedback must be moderated by the instructor, but creates a sense of community.

One-sentence summary. An activity used to determine a learner's ability to synthesize a complex process or a large amount of information. Learners are asked to answer seven questions—Who? Does What? To What or Whom? When? Where? How? and Why?—before stringing the answers together into a single sentence.

Plus/delta exercise. An activity used to collect participants' feelings about what they liked and what they would change about a particular experience or event. This is often conducted by someone other than the instructor.

Rubric. An instrument used for evaluation. Analytical rubrics are usually constructed as tables of items, called criteria, to evaluate, on one axis and levels of proficiency, usually called the range, on the other axis. Holistic rubrics give one score for the overall product.

Summative evaluation. A process used to determine the overall success of an activity or course after the activity or course has ended. This type of evaluation allows the facilitator or instructor to make changes and improvements before conducting the activity or course again. Current students do not benefit from their own feedback, but future students do, provided the instructor makes some of the suggested changes.

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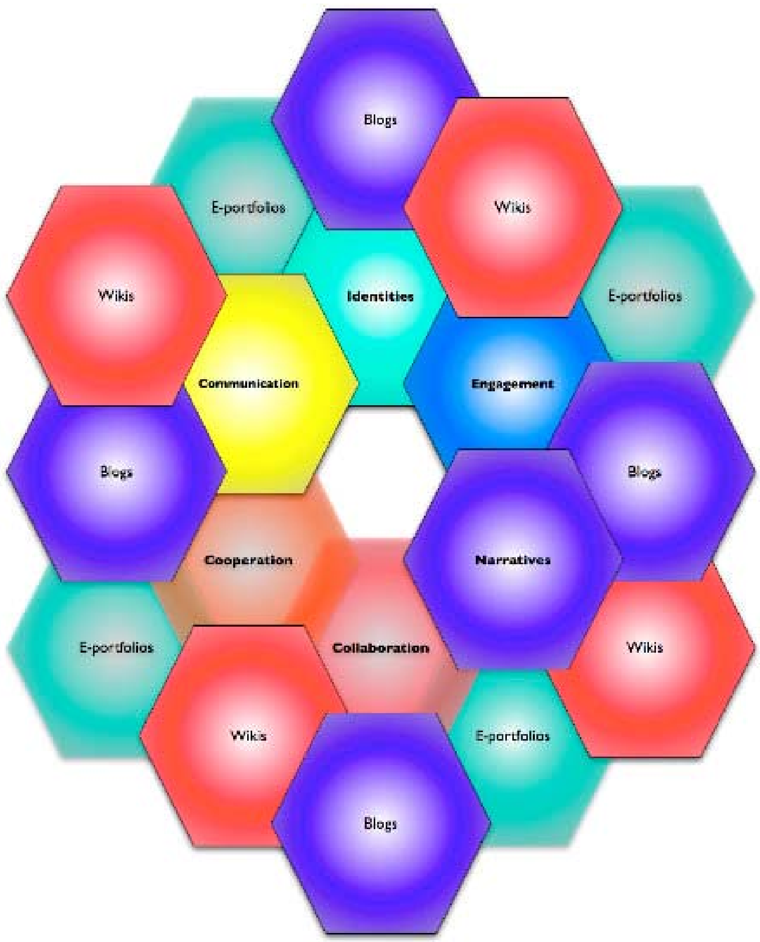
Part 5: Engagement and Communication

25
Tools for Online Engagement and Communication

Richard S. Lavin, Paul A. Beaufait, and Joseph Tomei[67]



[67] With contributions from David Brear

Learning outcomes

After reading this chapter, you should be able to use important online tools such as digital stories, **blogs**, and **wikis** to:

- Develop learners' online identities and communicative abilities.
- Engage learners with course content and with their peers.
- Develop online learner communities.
- Vary modes of participation.

You should also be aware of theoretical and practical issues surrounding these tools, and collaborative and collective online and blended endeavours.

Introduction

> "In the beginner's mind there are many possibilities, but in the expert's there are few." (Suzuki, 2006, p. 21)

In Zen Buddhism, there is a notion of beginner's mind (*shoshin* in Japanese), in which a person seeking enlightenment is asked to look at things *as* they are, without preconceived notions. A goal of looking at things from learners' perspectives is to see things the way new students do, and to anticipate problems and bottlenecks that they might face, a task that takes on added significance in light of the relative newness of online education. Online education acts as a universal solvent, dissolving many of the notions and axioms that we have taken for granted. Lynn Kirkland Harvey's observations about online identities (Chapter 29, Identity in Online Education) are important to keep in mind because the theme of online identity is one to which we often refer.

This chapter includes two sections on relatively new technologies—blogs and wikis—not only to introduce the possibilities of creating sets of many-to-many relations within classes, and potentially outside classes as well, but also to encourage educators to use blogs and wikis in their classrooms as a way of returning to a state of beginner's mind. These tools are not only powerful in themselves but may have an even greater potential when used together.

Joseph Tomei and Richard Lavin's section on blogs in this chapter argues that they may be the best (if such a claim makes any sense), all-round tool for **computer-mediated communication** (CMC). They are an ideal tool for helping learners (and educators) get their feet wet with online learning, and, revisiting Harvey's theme, they allow learners and educators alike to build their online identity in a semi-enclosed space from which they can venture out on their own terms to engage with others.

Lavin & Tomei's section on wikis points to some of the possibilities of these powerful tools for **collaboration** and some of the issues associated with them. They argue that, in general, wikis work better when learners already have a solid foundation in blogging. They mention recent work that attempts to merge the functions of blogs and wikis. Also in this section is a discussion of usability and flow. These concepts come to the fore with tools like wikis that are unfamiliar or can sometimes be difficult to grasp.

We then move to digital storytelling. David Brear walks educators through the process of planning and creating their own stories, preparing them to teach their students how to do the same. In the process, he takes one of the oldest urges of humankind and places it firmly in the technological present. The process of assembling various media and pieces of information into a story encourages deep learner engagement and can be a wonderfully effective way to master curricular content, while helping encourage a computer literacy that is becoming more and more important. David's guide also provides a fitting introduction to another of the underlying themes of this chapter, that of narrative structure, revisited especially in the sections on blogs.

Blogs, identity, and engagement

by Joseph Tomei & Richard S. Lavin

> "Our achievements of today are but the sum total of our thoughts of yesterday. You are today where the thoughts of yesterday have brought you and you will be tomorrow where the thoughts of today take you". – Blaise Pascal

INTRODUCTION

The blogging boom shows little sign of abating, and it is not surprising that more and more educators are showing an interest in using blogs for educational purposes.

In this section, we give a brief overview of blogs and what makes them work. We will assume in the bulk of the section that you will be helping your students set up individual blogs, which we would recommend in most cases.

A word is in order here on our teaching context. We are teachers of English as a Foreign Language (EFL) to Japanese university students, but we try to make our suggestions applicable to the widest possible audience. We feel that blogs are very flexible and can be adapted to a wide range of contexts and users. We recommend that educators wishing to take things further also take a look at the section following this one on wikis, which shows how a class with a solid foundation in blogging might profit from using this more collaborative tool.

WHAT ARE BLOGS?

For the purposes of this section, we will use the following definition of a blog, which appeared in a 1999 Salon.com column:

> "Weblogs, typically, are personal Web sites operated by individuals who compile chronological lists of links to stuff that interests them, interspersed with information, editorializing and personal asides. A good weblog is updated often, in a kind of real-time improvisation, with pointers to interesting events, pages, stories and happenings elsewhere on the Web. New stuff piles on top of the page; older stuff sinks to the bottom." (Rosenberg, 1999, para. 6)

The name *weblog*, now generally shortened to *blog*, is a portmanteau suggesting a logbook that is available through the Web. It is an outgrowth of programmers' *logs* in which actions are recorded in chronological order to help with troubleshooting and debugging. A variation of this practice involves programmers, often working in teams whose members are located in different time zones, themselves recording their own observations as **web-accessible** 'diaries'. Because this was all taking place on the Web, it was a logical step to add links to web pages, which conform to previous conceptual framings of footnotes as well as leveraging the power of social networks, in that following links from a person's weblog can introduce readers to material they would never find on their own.

As this process became a social phenomenon, software developers began creating blog software with features to improve ease of use, and entrepreneurs entered into the field of providing free blogs. Modifications to the software allow more advanced features like group blogging (where a group of people assume authorship), tags or categories (where posts are classified according to theme and for which custom views are available), and **comments** (where people reading a blog can comment on a particular post or simply communicate with the author or other readers), and these features have by now become all but standard.

Why did blogging become such a social phenomenon? We suggest that the main reason is that a blog conforms to a certain mental model of writing (the individual diary) that was built upon and extended. This may explain why wikis, the development of which predates blogs, have not caught on so quickly or widely. Blogs also benefited from a cycle of popularity, innovation, and commercial potential. Initial popularity triggered interest from developers, which led to rapid innovation and further popularity, in turn increasing the attraction of blogs to advertisers. This led to commercial blog services, which in turn created a critical mass of blogs as well as a host of other services and capabilities (photo-sharing, RSS feeds, **trackback**, **tagging**), which continues to feed the development of blogs. The result is a rich ecosystem of tools and services, ready to be exploited by educators.

The situation is good and getting better, though there is one proviso: There is not one ready-made and proven solution for every situation, so educators need to be willing to experiment with various tools and services to exploit blogs to their full potential.

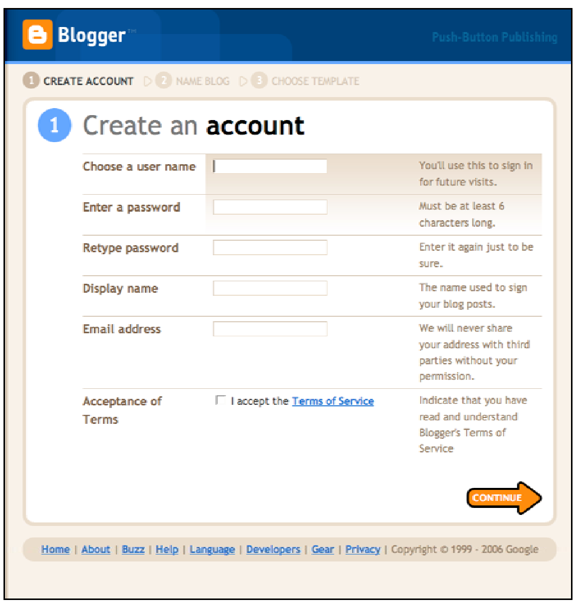
SIGNING UP FOR A BLOG

Currently, there are many blogging services, ranging from the free and very large Blogger (formerly BlogSpot) with an estimated 14 million blogs as of July 2006 (Riley, 2006) and WordPress.com to smaller hosting services such as Squarespace. It is beyond the scope of this section to cover all of the possible alternatives for starting a blog, but creating a generic example and stepping through the sign-up procedure can establish some points of reference. For this example, we will use screenshots of Blogger (http://www.blogger.com/) to illustrate the process.

Entry page *for Blogger*

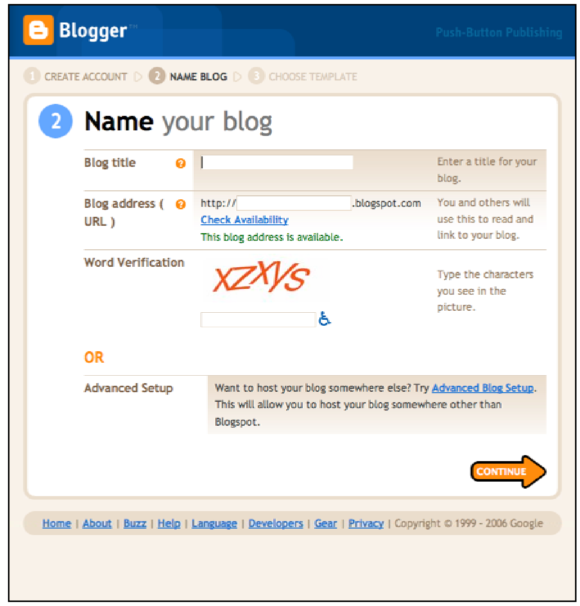
A key advantage in using a service like Blogger is that it relieves you of the responsibility for installing and maintaining software. It also allows for a wide range of student computer connections and setups and links to a range of computer services. For example, here in Japan, all of our students have camera-equipped mobile phones. Blogger permits the **uploading** of photos to a blog from a camera, and has connections with photo-sharing services like flickr.com. This increases the options for students and eliminates the need for computer storage. This model may be the best one for educators who have access to Internet-connected computers but do not have extensive tech support resources.

It is convenient to view the signing up/creating process of a blog as having three separate stages. In the first stage, the prospective blogger presents or creates his identity and password so that we can know who owns, and is thus responsible for, the blog, although in very large classes it may be impossible to ensure that students are doing their own work.



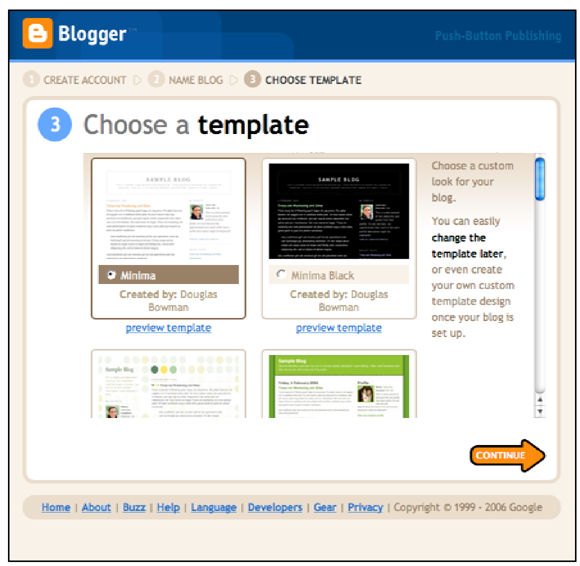
Sign up page for Blogger

The second stage is creating the location in **cyberspace**. Most free services have you choose an identifier that is then prefixed to the service's domain name to form your own subdomain. However, edublogs (http://edublogs.org) derives this information from your login details. This is a significant difference between free blogs as part of a business model and blogs in the classroom. In the classroom, we assume that students want to participate (and receive credit) under their true identity, but blogging as a social process may well entail assuming pseudonyms.



Finding a place in cyberspace with Blogger

The final stage is personalizing the blog, which involves choosing a look and feel, usually through choosing a **template** and setting various options, such as who can comment on one's blog and whether the comments will be moderated before they appear.



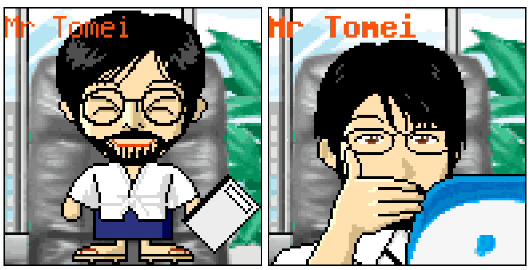
Selecting templates in Blogger

Often, when introducing blogging to new classes, these three stages are fused into one. This may be fine with computer-savvy students, but with students who are less technologically fluent it is useful to separate these stages, so that it becomes easier to identify where students are having problems and devise appropriate remedies.

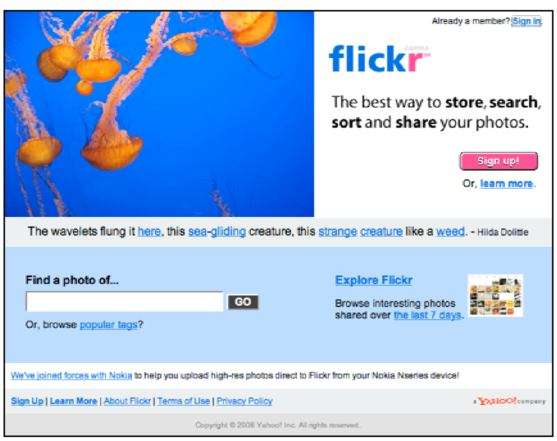
BLOGGING AS SELF-EXPRESSION

An essential step in creating a successful blog is that the blog must reflect a personal identity of the blogger.[68] Thus, any steps you can take that allow students to demonstrate their personal identities within their blogs should be supported. Some of the things that can help are:

- encouraging student choice in naming their blog
- encouraging students to choose a template for themselves, rather than insisting on a standard template
- using and creating an **avatars**, a representation of the blog author



- encouraging students to post pictures through services like flickr.com and photobucket.com



Entry page for flickr.com

- suggesting niches where a student might situate their blog within their peer group, perhaps writing about a specific set of topics or even just one topic.

[68] Readers interested in identity should refer to Chapter 29, Identity in Online Education.

It may be tempting to save time by cutting these steps short, but this may be a false economy. As an illustration, in one class, in order to simplify the signup procedure, students were instructed to entitle their blogs "(name)'s Diary" and the form of the URL was also stipulated in advance. This did save some of the considerable time that it takes our (non-native English speaker) classes to complete the set-up procedure, but the blogging aspect of the class never reached a critical mass. Conversely, some of our most successful blogging experiences have occurred when students have found an interesting or unique way to personalize their blogs that has been adopted by others in the class.

A DIGRESSION ON LEARNING MANAGEMENT SYSTEMS

At this point, it is useful to consider the difference between the pattern of blog usage we propose and the use of a CMS or LMS (course/learning management systems) such as **Moodle** or Blackboard. Our use of blogs (and also wikis) exemplifies a "*small pieces loosely joined*" approach (Weinberger, 2002), which emphasizes the use of tools that we call *bland technologies*. These are small (i.e., having one central function), inexpensive (often open source and/or free) tools that can be combined with other such tools to create a learning system that is appropriate for your specific situation.

Once students have a blog, you (or they) can choose whether they also need, for example, a flickr account for photo sharing, and, later, whether you want to add a wiki to the mix. Blogs can be read by the outside world, which can be motivating, and this aspect of blogging offers an opportunity for students to think seriously about audience. Moreover, when the course has finished, students still have their own blogs to use as they see fit. By contrast, a CMS or LMS is generally a closed system, so viewing is restricted to those within the system. In addition, students who have finished a course, or graduated from an institution, may no longer have access to the system.

Using free services permits schools and teachers with tight resources to avoid purchasing software or even storage space. A teacher can put together an entire online course using free websites.

EVALUATING BLOGS

One question that arises is how to evaluate student blogs. In our work with EFL students, our chief concerns are to encourage self-expression and regular writing to develop fluency. In an attempt to quantify this, one of the authors uses a weblog assessment index

(WAI), which we present here as one possible evaluation metric. Students are given WAI templates and are asked, in their final post of the semester, to calculate their own points. They are also encouraged to do this on a provisional basis from time to time throughout the course, so that they can have some idea of their performance and how to improve it if necessary. These occasional self-assessments can also lead to negotiated changes in the WAI, for example if some positive behaviour that the teacher did not originally envisage occurs. For example, an assessment item below was introduced when it was found that one student was using her blog as a vocabulary diary to reinforce study material from another class.

Calculating your Weblog Assessment Index (WAI)

Take the number of words you have written
Add the number of posts × 20
Add the lowest number of monthly posts × 100
Add the number of vocabulary posts × 50
Add the number of book posts (reviews, etc.) × 50
Add the number of posts with links to outside × 20
Add the number of posts with links to other class blogs × 50
Add the number of posts with links to other WinK blogs[69] (not your own class) × 100
Add the number of posts with pictures, a suitable title, and at least 2 sentences × 30
Add the number of posts reflecting on your blogging or study × 100
Add the number of complex posts × 20
Add the number of comments made on other blogs × 20
Add the number of incoming comments × 10
Add the number of reviews written by you on Amazon and linked to from your blog × 30
Subtract the longest period you didn't blog (days) × 30

Notice that the number of words, typically in the thousands, is the base here, and the multipliers for the other items have to be decided based on experience in a specific course. If the multipliers are too low, students may decide that it is not worth learning, for example, to create links, and they may devote their efforts to writing longer posts. Conversely, if the multipliers are too high, students might, for example, link to another post each time they write for trivial reasons, using this as a way to avoid writing a reasonable number of posts. We have found that some adjustments in the multipliers have been necessary each year.

For example, in our April–July semester courses, there is a week-long public holiday at the beginning of May, which comes just as students are getting used to blogging and would normally be expected to start increasing the frequency and length of posting. This tends to lead to a drastic dip in contributions. The third and final items in this version of the WAI seek to counteract this, as any extra posts in the least prolific month will increase the positive score, and even a very short post during the holiday will decrease the minus score.

Although teachers in other contexts are unlikely to find that the WAI, in its present form, is appropriate for their needs, if you accept the principle of quantifying behaviour that you find desirable, you may find it a useful base. In general, we suggest that courses pitched at more advanced levels, or those where students are keen and able to write large quantities, may benefit more from conventional rubrics, while courses where blogging is initially difficult for students may profit from the WAI or similar schemes.

EXPANDING HORIZONS WITH BLOGS

After the student blogs have been established, our goal is to have students expand the horizons of their blogs. There are two ways to do this. The first is through comments, which students usually pick up with no, or very little, guidance. The second is through linking, which can be to external pages, bringing in new material, or to other student blogs, which links the students together. The latter possibility can be enhanced with the use of trackback. When trackback is available, if student A writes a post linking to student B's post, a link to student A's post, along with a short excerpt, appears at the foot of B's post. This is far more powerful than conventional linking, which is strictly one-way.

There are a number of targeted exercises to guide students through the possibilities. Below are a few examples:

- meme tag—In this activity, the teacher asks the students to 'pass' a task to other students, linking to the previous students to perform the task. This may be as simple as the Alphabet Shopping Game, where the teacher posts 'I bought Apples and Bananas' and asks the next student to link to that post and add an item beginning with C, and then pass the task on to another student. A more complex example might be to ask students to list their favourite three meals, again passing on the task to another student.
- pininthemap.com—Ask students to identify a place using pininthemap.com, and then write a blog post about the location;

[69] WinK is an acronym for Weblogging in Kumamoto, a local community of university students blogging in the Kumamoto area.

- topic of the day, week, month;
- specific assignments or writing topics to be posted on the blog; and
- introduction of specific websites for topics related to the class. A class dealing with movies might be introduced to the Internet Movie Database (imdb.com) or a class dealing with public health issues might be introduced to the flu wiki (fluwikie.com).

Note that the last site is a wiki, which is a form of collaborative software discussed after blogs and again in Chapter 26, Techno Expression.

Many of these exercises may simply be mechanical, but they allow students who lack specific computer/Internet skills to acquire them, while doing something that, though perhaps trivial, is also fun. They also provide the teacher with a metric to assess students' comfort level with the technology. It is useful to distinguish clearly between the technical requirements (**hypertext** linking, copying, or editing) and the content aspects of such exercises. Having students hone their technical skills in this way allows them to gain a measure of automaticity (Hasher & Zacks, 1979) and allows the class focus to shift gradually from technical to content aspects. It also serves to give students a measure of computer literacy that will continue to be of use in other classes and after graduation. These tasks can often promote a sense of social community within the class, and, if linked to the course material in some way, can prepare students for more demanding tasks later.

THREE SCENARIOS

In general terms, there are three scenarios for using blogs and wikis in education:

(1) Providing an added dimension to the physical classroom.
(2) Housing the majority of the material and provide a focal point for occasional face-to-face classes.
(3) Allowing teaching and learning to take place in a totally online environment.

It is useful to consider the different strategies required for each. In a class where blogs or wikis are supplementing the class material, the teacher can easily draw upon relationships and organization developed in the classroom as a framework for using the technology. A teacher may simply be providing supplemental materials (a blog where he or she writes all the posts, a wiki which has supplementary class material) and the blog would simply provide an **asynchronous** channel for comments.

In a class where the online component is the greater part of the class, the teacher should consider using the classroom relationships and organization as an initial structure in order to develop the online component. An analogy is to a seed crystal, which, when added to a supersaturated solution, has the effect of creating a crystal structure from this initial seed. This may not be possible if the first face-to-face meeting occurs after the start of the class, which would make the class conform more to the third scenario.

In the third case, the teacher must find ways to create relationships and organization from scratch. Thus the teacher may be doing some things that appear overly simplistic. However, assuming that students will be able to organize themselves with ease online in the absence of the familiar framework of face-to-face interaction is usually overly optimistic, and we may at first do well to err on the side of excessive handholding.

BLOGGING ISSUES

We have given a rather optimistic view of using blogs, so it is useful to introduce a note of skepticism here and discuss some problems associated with their introduction. Here is a useful list of problems that were faced by one educator with blogs (Chirnside, 2006), interlaced with our own comments. He writes:

> We have run several f2f [face-to-face] events here in our town to raise the issue of blogs. Has not worked really. It's just been too much.

Our own blogging ventures have to a large extent been focused on the long term: we tend to think in terms of introducing blogging into the system, as much as or more than introducing blogging to students. It is very tempting to expect students to create fully formed blogs with long posts, substantive comments, and a vibrant network of linked blogs, but thinking in terms of introducing blogging into the system (i.e., to fellow educators and into the curriculum) rather than to your current students encourages smaller and more realistic steps. Having the first set of students simply use a blog as a cyberlocation for a set of assignments that can then be perused at the teacher's leisure establishes blogs without overly high expectations.

The writer goes on to draw some conclusions about blogging:

- Introducing blogs into an educational setting seems to work best if there are some experienced bloggers around.

Most courses do not afford enough time for too much trial-and-error learning. There are psycho-emotional barriers and tech things as well.

Thinking of blogs as curricular innovation rather than individual achievements helps create an upward spiral of improvement. While we expect (and hope) that students will graduate from our class and not have to return to be taught the same material, the products those students have produced in the previous term or year can be highlighted, even if those students have moved on. Choosing examples that constitute best practices from the previous term also helps to overcome psycho-emotional barriers as well as tech problems. Think of the introduction of blogs as a learning process for the teacher as well as the students.

- Some of the important issues involved personal questions of identity, voice and security, confidence and audience.

  For some students it takes time to build the confidence needed to actually post, and to come to grips with what blogging is about—it is quite different from **forum** posting and traditional academic writing.

  As we noted earlier, helping students make the blog their own is of crucial importance. In this context, getting students to think about how they present themselves to others is key. What personal information would the student like the teacher to know?

  What to write is another problem, and one way to address this is to give specific assignments, as well as the kind of blog games recommended earlier in this chapter, in the Expanding Horizons with Blogs section.

- Unsure … whether clear [targets] …work against blogging. [Students get too caught up with] "How many posts do I have to make?" "Does this count?"

  In a traditional class, a student is expected to show control (or ideally mastery) over the content presented. However, this notion that there is discrete content, separable from other facts and skills, is one from which education has been moving away, towards a goal that the student be able to use the content presented in real-world situations. There is no way to prevent some students from aiming to fulfill only the minimum requirements, but blogging, in common with many other online activities, does provide a more-or-less automated way for the teacher to ascertain if the student is working throughout the term, rather than rapidly writing the requisite number of blog posts in the evening before the final evaluation.

- Private online forums seem to have a different dynamic than blogs (ownership, identity, group, etc.).

  This is very true, and such forums can prevent weaker students from getting a foothold. Blogs, because they constitute individual spaces, help overcome some of the problems that can be seen in online forums.

- Unsure about community blogs. I think (tentatively) they can help bridge to genuine personal blogs. But I do know they can assist in achieving learning outcomes … And I think they are different to forums.

  While community blogs are a possibility, as noted above, we view them as something best done subsequent to personal blogging.

- I think blogs are sometimes a huge bonus in informal professional learning settings. Sometimes they are not.

While we have presented an optimistic view of blogs, preparing the groundwork for using blogs is time-consuming, just like introducing any new technology or technique into the classroom. Providing opportunities for peer review, self-evaluation, groupwork, or other techniques can be described in the same way, so this is not something that is a characteristic solely of weblogs in particular or software in general.

> Back to things not working. We just found it too much to go from zero to blogging in one hit. The key to using blogs in any educational context probably starts with reading blogs. (Chirnside, 2006)

This point cannot be emphasized enough. Setting aside time within the context of the classroom (in a mixed class) or specifically requiring students to identify good posts and link to them, adding their own thoughts, is one of the things that has helped fuel the growth of blogging in our classes.

ONLINE DANGERS

In addition to the specific issues with blogs dealt with above, any type of online interaction presents certain dangers in two directions. Teachers must not only consider the social responsibility aspect but must protect themselves from possible legal action. The first source of danger is outsiders viewing what your class has done. Strongly urge your students to avoid using their full names or any data that could be misused. You may also want to suggest that students avoid posting pictures of themselves. This presents a conundrum, in that we have recommended that students establish a personal identity with their blog, but one that cannot be easily traceable. As we noted in the section on signing up for blogs, commercial blogs often separate real identities from online identities by permitting the use of nicknames or handles. The use of avatars in place of actual pictures also supports personal identities without risking sensitive personal information.

Also, because the walls of the classroom are now, in a sense, transparent, the teacher has to consider activities and exercises where the teacher may take a controversial position in order to stimulate participation. Consider a discussion on free speech where the teacher, in trying to get the students to consider the limits, takes on the persona of a white supremacist or asks students to take that role. This would ideally be understood as a classroom exercise in the context of the classroom, but it is possible that someone could stumble upon it while surfing the Internet and, shorn of context, believe that it represents the actual views of the teacher or students.

Below are a number of situations that could arise:

- A student writes a sarcastic review of a local eatery that suggests the owner uses non-standard ingredients.
- A student notes that, along with another student, they engaged in some embarrassing and potentially illegal behaviour.
- A student discusses one of your colleague's classes in unflattering terms.
- A student makes a post or comment directed at another student using inappropriate language.

Situations like these are generally avoidable if the teacher sets clear guidelines, but it is important that the teacher consider the possibilities before they arise.

BLOGS AS THE CMC TOOL OF CHOICE

There are as many teaching situations as there are teachers and classes. In some distance learning situations, a priority may be to bring all learners together at the same time to communicate in real time. In such cases, teachers will typically employ chat or a similar tool, either a standalone tool or one embedded in a learning management system. In another case, a teacher may want to field occasional questions from students and will probably decide that email is the simplest way to go. If questions are rather more frequent, and the teacher occasionally sends out announcements, then a mailing list may be worth setting up.

All of these choices are valid, as they are based on the teacher's judgment of his or her needs within a specific context. There are many cases, however, where it is difficult to ascertain exactly what needs exist. In face-to-face teaching, especially where there is a single weekly class meeting, a teacher may have a vague feeling that some computer-mediated communication (CMC) tool would enhance a class or extend its boundaries, even though there may be neither institutional requirement nor student demand for such a thing. In such cases, there are many tools that would probably fit the bill. The authors, and countless other teachers, have variously used email, mailing lists, chat, and discussion forums in this way, and they have found that each offers benefits.

In general, however, we suggest that benefits are likely to be greater in the long term, and more open-ended, with blogs rather than with other CMC tools. A teacher can start by creating her own blog and inviting students to visit it from time to time. To make it worth a visit, she might post a summary of each class as soon as it has finished, and add some remarks about the next class a couple of days beforehand. Then, once students have become used to reading a blog, they can be led through the signing up process as detailed above.

Blogs may function as a simple online journal and then morph into a conversational tool, making them, in our view, of more general value than other existing tools, and, because each blog belongs to a student rather than to a course, more likely to be of continued use.

Notwithstanding the above, if your main need is to inform students of a room change tomorrow, you should probably stick with email. In most contexts today, email is a given, and blogs can be introduced on top of this without overwhelming students.

Another proviso to the above is that our advocacy of blogs is centred on learning needs of students. Tracking students' work, whether as an institutional requirement or to make life easier for the teacher, is something better done with a learning management system (LMS). LMSs are dealt with in Chapter 7, Learning Management Systems.

GROUP BLOGGING

After getting students to develop their own personal blogs, it is possible to move to group blogs. In our experience, though it may seem more efficient to create group blogs initially, this generally fails if students do not have any previous experience in blogging. Thus, we feel group blogs should be introduced only after learners have developed sufficient familiarity with individual blogging. In our experience, groups of two to five members are best, as too many bloggers flooding a single blog with multiple posts leads to entries being pushed down from the top of the screen too quickly and therefore missed.

There are two ways to have students create a group weblog: the first being a real group blog; the second being a technical hack to create something that looks very similar. The first is to establish a new blog where a small group is given status as co-bloggers. This entails creating a new space, but, from a technical standpoint, this is the easiest way to accomplish a group blog. A second way is to take individual student blogs and group them together using an RSS (really simple syndication) or similar feed, which scans a blog and, when a post is added, sends a notice, an excerpt, or the entire post to another blog. By scanning individual students' blogs and compiling changes in a central location, the effect is to create a group blog.

FUTURE DEVELOPMENTS

It seems almost certain that blogging is set to expand further. We may soon reach a point where the technical ability to create a blog and write a post is all but taken for granted, much as the ability to use a mouse is now. More recent developments such as vlogs (video blogs) are now receiving attention. Though these are valuable potential enhancements to our courses, educators need to be sure to leverage the opportunity presented by students' greater familiarity with blogging by putting greater effort into improving the content of blogs and refining the teaching practices that use them, rather than diverting all our energy into learning and teaching the latest advances.

Another important point is to avoid the duplication of effort and wasted opportunities caused by the continued institutional focus on what are often styled course silos, which might lead different teachers to separately require students to create blogs for their courses. Blogs belong to the learners, and we should never require learners to create a new one without good reason. Rather, we should encourage learners to use the categories or tagging features provided by most blogging software to organize work in different courses, for example by creating a "Psych101" category or tag.

In line with the point that blogs belong to the learners, it is wise to be cautious of providing blogs through a learning management system, since there is a danger that students will lose access to their blog on graduation.

FURTHER READING ABOUT BLOGS

For educators wishing to read more about blogs, a good starting point would be Rebecca Blood's *The Weblog Handbook: Practical Advice on Creating and Maintaining Your Blog*, which has excellent advice that continues to be timely despite technological changes in the years since its publication. In addition, the tutorial pages on blogging service sites (the Blogger™ Help Centre, for example) are well worth a look.

BLOGS LEADING TO WIKIS

We have discussed blogs from a classroom standpoint, with the assumption that educators want to have students create blogs and ideally link those blogs to a network to create a social environment that expands the horizons of the classroom. This expansion is both in the sense of time (in that students can participate asynchronously), space (in that students can bring in their own experiences and situations), and cyberspace (in that students can, through linking, bring in other websites and information). This is all easily achievable through what is available now on the Internet.

The next section, about wikis, describes software that is less established and does not fit so easily into earlier mental models of publishing. For this reason, our discussion of wikis, in contrast to our discussion of blogs, tends towards the theoretical. However, we feel that blogs provide a foundation that may be necessary for students to take full advantage of the possibilities of wikis.

Wiki technology for online education

by Richard S. Lavin & Joseph Tomei

> "The parts are the tools within the whole, they make sense only in the unity of the whole, every single organ performs its intended goal for its organism and this intentional functionality is not situated outside of nature but its value lies within it". – Alexander Neuer, 1936 (Stein, n.d., Alexander Neuer, para. 2)

INTRODUCTION

Wikis are collaboratively editable websites that can be used for various purposes. They are particularly well suited to taking students who are already competent bloggers to the next level.

From weblogs to wikis

For many contexts blogs may be the tool of choice, and sufficient by themselves. As we have shown in the previous section, they can be used for a wide range of purposes and can foster reflection and communication among students, classes, and institutions, and thus they can move us in the direction of learning communities.

There are cases, however, where blogs alone may be limiting. There may be a need to bring older blog posts to the forefront, to build on earlier discussions or knowledge. Of course, this is always possible, through an archive search, followed by copying and pasting into a new post or linking to the old post, but blogs, because of their temporal organization, are not ideally suited to such use. It will sometimes be desirable to have a more-or-less complete snapshot of the state of knowledge built up over a course, possibly several iterations thereof. Again, the teacher could conceivably write a summary linking to key posts that contribute to such an understanding, but this would be an inefficient use of a blog, and that summary post would again be pushed down the stack as new content was added.

In such cases, we suggest that wikis provide an answer, if taken with "a measure of caution" (Tomei & Lavin, 2007, p. 26). Wikis are free-form, collaboratively editable websites, designed to work with a minimal set of simple markup commands rather than the more difficult HTML. Content can be arranged in whatever ways make sense; and, since wikis are simple, they can be edited as needed. Although wikis can be used as standalone websites, independently of blogs, here we are interested in the possibilities for complementing blogs. A wiki could be used to archive key blog posts in an easy-to-find organizational scheme, together with extra details or commentary. Alternatively, it could be used as a database of background information to raise the base level of the blog discussions.

It is their collaborative **editability**, however, that makes wikis such powerful tools, potentially enriching students' interactions and fostering **cooperation** and collaboration inside and outside the classroom.

What are wikis?

In the preceding section, we gave an informal definition of wikis. Before discussing how to use them in more detail, let us attempt a more rigorous definition, which may serve to clarify their uses, strengths, and weaknesses. Wikis may be defined as instantly updateable, collaboratively editable, radically hypertextual websites. Let us take a look at each component of this definition.

"Instantly updateable" means that there is no need to edit a local copy of a website, upload the new version, and then reload the new version in a browser. Though such a process is not difficult, it is just enough trouble that countless small-scale websites remain untouched for long periods of time. (Teachers reading this may be familiar with the leave-it-till-the-end-of-term syndrome.) With wikis, it is enough to click the Edit button, correct a typo or change a deadline, for example, and then press Save to implement the change.

"Collaboratively editable" means that there can be multiple authors of a website, possibly at multiple locations, or people other than the authors who are able to make changes. This is the feature that is of most interest to us in this chapter, though it is best to keep the other features in mind.

When Tim Berners-Lee devised the original specifications for the World Wide Web (Berners-Lee, 2000), he envisaged that everyone would publish and edit information, rather than just read pages and click to follow links. Instead, for a time the Web became something like a "glorified television channel" (Berners-Lee, 1999). Wikis started the move towards a web more in line with Berners-Lee's vision.

Consider a standard hyperlink on a web page. In the absence of specialized software, you need to use a moderately complex code to create it. It points to a whole page, which may be quite long, and you may have to do further searching within the page for the information you want. The destination page does not point back automatically to the originating page, so if your browsing had taken a different route you might never have discovered the connection between the two pages. And if you link to something that does not exist, you get an error message.

Hypertextuality means that links are two-way rather than one-way, so you can find your way back to pages you have looked at before and also to pages that link to the page you're on. (This is essentially the same technology as blog trackbacks, discussed earlier.)

Links can point at small chunks of information, rather than whole pages; and information can be organized freely, without resorting to hierarchical structure based on directories and sub-directories. Most importantly, as long as you know the name of a page, you can link to it without knowing where it is within the wiki. The system used in most wikis is known as CamelCase, as, in addition to an initial uppercase letter, CamelCase words, otherwise known as WikiWords, feature a hump or humps of intermediate uppercase letters.

This does not apply only to pre-existing pages; new pages can also be created using the same syntax, meaning that it is very easy to expand on existing information, and even add whole new categories of information. This is why Klobas (2006) suggests that the Berners-Lee dream of a fully interactive web may already have been surpassed, thanks largely to wikis.

Wikis and Wikipedia

Since Wikipedia is now the best-known wiki in existence, it may be useful to take a closer look at wikis through the lens provided by Wikipedia, noting features that are in common with other wikis and those that differ. Most readers will probably have heard of Wikipedia. It is a large (more than 1,800,000 articles as of June, 2007), multi-lingual (fourteen languages with more than 100,000 articles, and more than 60 languages with smaller numbers), freely accessible to anyone with an Internet connection, and, more radically, freely editable, in principle, to anyone in the world.

Entry page for Wikipedia (http://wikipedia.org/)

Thus, anyone who finds an article with factual or typographical mistakes can rapidly correct the mistakes. Similarly, if an article exists but is incomplete (many of these articles are marked as “stubs”) anyone with knowledge of the topic can add details or links to further resources. As long as this is done with a sense of responsibility, students who contribute in this way can justifiably feel they have made a real contribution to human knowledge, if only in the sense of making knowledge already available in one place simultaneously available in another, more central, location.

Wikipedia can be said to be typical of wikis in the sense that there are generally no specific software controls over who can change the wiki (except that certain IP addresses that have been identified as the source of malicious changes are excluded, but only after a process of consideration by members of the community). It is atypical in the scope of its subject matter and in the size of its target community. In fact, since most communities are partially defined by whom they exclude, the Wikipedia community is very unusual since potentially it includes all humankind (though in practice, of course, some may never hear of Wikipedia, some may not be interested, and many, for economic or geographical reasons, may never have access).

The other major wiki that we will mention is Ward’s Wiki, the wiki created by Ward Cunningham, the inventor of the first wiki engine (found at http://c2.com/cgi/wiki?WikiWikiWeb). This wiki’s subject matter (People, Projects, and Patterns in Software Development) is rather esoteric and may hold little interest for most people. However, its discussions on thread mode and, more broadly, on wikis, how they are used, problems with wikis, how to choose a wiki engine, and so on, are most valuable. In addition, Cunningham has resisted the recent trend to add features to wiki engines, consistently favouring simple code and a minimal feature set. Thus, this wiki functions as a useful reference point when comparing wiki engines or when defining what is often termed wikiness.

It might be overstating the issue to claim that these two wikis represent the alpha and omega of wikis, and all other examples would fall somewhere between them, but they serve as two useful poles of wiki development, that of a constantly evolving and growing set of pages and users and a smaller, more focused, and maximally simple wiki that might help you understand the tension between the two poles.

INTRODUCING WIKIS TO STUDENTS

The nuts and bolts of choosing a wiki engine to install oneself, or a wiki hosting service to make the installation unnecessary, is dealt with in greater detail in Chapter 26, Techno Expression, so we will avoid details here. We will instead focus on the practical and pedagogical issues once the wiki is installed and ready to use.

We should emphasize first, though such warnings may be unnecessary, that simply creating a wiki site and telling students to “interact” (or “collaborate”, or “play around”) on the site is unlikely to work satisfactorily, unless students are very mature and self-motivated and they have a lot in common, or a ready-made purpose in the nature of the course. Whereas it is fairly easy to start students blogging by describing a blog as an online diary and asking students to introduce themselves or write about what they did at the weekend, such an obvious entry point to wikis does not exist. Since processes are best explained in terms of steps, and problems are best solved by breaking them down into sub-problems, we shall take a closer look at possible difficulties with wikis in the next section.

Wikis are not easy

For inexperienced learners, wikis may be a difficult tool, and therefore it may be difficult to create the conditions where they lead to real engagement. In addition to general computing skills such as typing, copying, and pasting, the major characteristics of wikis given above point to possible areas of difficulty.

Initially, it may take some students a long time to get used to the simple but radical idea of **instant updateability**. They may not notice the Edit button, for instance, until it has been pointed out to them several times. Since they are not accustomed to web pages being editable, their eyes may at first gloss over the editable window in the centre of the page as they search for something recognizable as a database field to fill in.

Collaborative editability represents a complex melange of technical and social issues. Students may resist the very idea of touching someone else's work without specific permission or conversely be offended when someone touches theirs. Even when they have become accustomed to the Edit button, it may not occur to them that it is possible and permissible to actually edit existing pages, or even sentences and paragraphs, and they may restrict themselves to making new silos with their own personal content. Thus, it is advisable to be ready to give extensive instruction to students in these possibilities, along with guidance on any restrictions you wish to impose.

Finally, the radical hypertextuality of wikis can cause severe disorientation. It may take students some time and considerable guidance to master the mechanics of making links. Even then, it may not be possible for all students to grasp the structure of the wiki as a whole, resulting in difficulties fitting in new content and linking it to other relevant pages.

Blogs as an entry point to wikis

Our own experience with weblogs and wikis has led us to conclude that weblogs can act as an entryway into using wikis by establishing a firm foundation for learners. Some of the skills necessary for wiki use that can be established by regular use of weblogs are as follows:

- manipulating computer text (copying, cutting, pasting),
- using tags and understanding how they work,
- writing short coherent paragraphs of content,
- commenting on others' work,
- linking to external sources, and
- linking to internal sources (within the weblog).

These skills may seem so basic as to need no introduction, but we have found that even groups of sophisticated learners, when placed in a new environment, often transfer only some of these skills, and then only fitfully.

Using Wikipedia and other global wikis

Since most students will probably have heard of Wikipedia, and many may have experience using it for reference, this may be the easiest entry point. The teacher could find a page on a topic of interest to the class and show the present version and selected older versions for comparison. If there is a live Internet connection, the teacher could find a page with typographical or minor factual errors and correct them in real time, explaining that anyone throughout the world can now benefit from the new version. If students are deemed ready, and of course with appropriate supervision, they can be guided to pages that they can improve, and be invited to make minor edits. This should be sufficient to demonstrate that wikis are valuable tools.

If Wikipedia is considered somewhat forbidding, there are other global wikis that allow students to improve the world in some small way by correcting faulty information or, more commonly, providing missing information. We shall introduce three of these here: Wiki Travel (wikitravel.org), Wikia (wikia.com), and Wikibooks (wikibooks.org).

When we were looking for a simple wiki-based project to excite our tertiary EFL students in Japan, we were delighted to discover that Wiki Travel had no mention of the students' home area of Kumamoto. Although the students' writing proficiency is fairly low, as are their technical skills, they were able to create this section and provide some useful information to prospective travellers. The fact that there was no existing information lowered the stakes, since any information they could provide represented an improvement. They were delighted when other Wiki Travel users from around the globe corrected some of their linguistic errors. Subsequent **cohorts** were surprised to discover that the Kumamoto section had been created by their seniors, many of whom they knew personally, and were pleased to be able to build on their predecessors' work.

Our students' experience with Wiki Travel also points to some potential pitfalls with projects of this kind. One of the Wiki Travel guardians at one point asked us to make sure that students' work was corrected before posting in the wiki space proper, since the majority of articles are quite polished. They suggested that students' personal pages within Wiki Travel would be a better place to host relatively raw work, prior to polishing, perhaps via peer editing, and moving to the wiki space proper.

Wikia, formerly known as Wikicities, features thousands of wikis on specific topics. Many of these are related to places, and the focus differs from that of Wiki Travel in that they are not aimed primarily at tourists but typically at providing a convenient information source for residents. Places that do not have enough articles to make it worthwhile creating a separate wiki can have an entry in the Towns, Villages, and Cities wiki. Most wikis on Wikia are still in their infancy. This lowers its value as an information source, but at the same time maximizes its potential for student projects.

Wikibooks is an attempt, launched in 2003, to provide textbooks on a whole range of subjects, and as of June 2007 there were over 25,000 English-language wikibooks available, in various states of completion, on topics ranging from organic chemistry, the solar system, and quantitative finance, to bartending, Turkish, and table tennis. A smaller number of modules in an assortment of languages are also available. Wikibooks are divided broadly into Wikijunior books (aimed at ages 8–11), Wikistudy books (typically aimed at secondary education examinations), Wikiprofessional books (typically aimed at those preparing to sit professional examinations), and Wikiversity books (all others, with an emphasis on the idea of lifelong learning). Since the wikibooks have a very serious purpose, any project aimed at improving any of them should have a similarly serious intention.

An example of such a successful project is the Rhetoric and Composition Wikibook started by Matt Barton and his students in a composition class, announced on Kairosnews (Barton, 2005a), and further explained on Barton's website (Barton, 2005b). The wikibook is for students in first-year university composition classes, and thus represents a case of near-peer role models creating course materials, tempered by collaboration with instructors. As of this writing, the book is available online for editing and also as a free PDF download (http://en.wikibooks.org/wiki/Rhetoric_and_Composition).

Other simple wiki projects: conventional website plus

The fact that wikis have great potential as collaborative writing tools does not necessarily mean that they must always be used in this way from the outset. One way to get started is for the teacher to use a wiki as, at least initially, a conventional website. This could include the syllabus, assignment deadlines, and useful resources. An opportunity to show students that the site is not quite like the ones they are used to is presented when an error (strategically inserted beforehand if necessary) is discovered during a class meeting, or if a deadline is renegotiated, for example. Far more powerful than a promise to update the site later is to instantly correct the error and show students the new version on the spot. Taking this a little further, when during a class a new concept is introduced, the teacher could create a link to a new page introducing the topic and create a two- or three-sentence page stub on the spot.

Once students have had a chance to see a wiki in action, its collaborative editability may not come as such a shock. The teacher could prepare for a class meeting by creating an Introductions page, containing links to each student's name (typically a full first name, followed by the initial letter of the surname, such as *RickL*, or *JoeT*). Students should know that the page will not exist until they click on the link.

The above example can be taken as far as necessary. If the teacher notices that several students have the same hobby, she could create a page devoted to that hobby, with a descriptive title such as *TrainSpotting* or *ReadingBooks*, and show students how to link to the page with minor changes to their own sentences; for example, simply changing *I like reading* to *I like ReadingBooks*. As a simple demonstration of the power of the richer model of hypertext employed in wikis relative to the Web at large, teachers could show how the back-links to the ReadingBooks page constitute a list of all students who like reading.

In this way, apart from giving students a painless introduction to wikis, any divide disappears between the official course website and the course wiki as a new tool to be understood (and a new URL to be remembered). It also constitutes a very low-risk strategy, as not very much depends on successful completion of any wiki-based assignments, and in any case none of the assignments mentioned is difficult enough to make failure likely.

Even if students do not take to the wiki, the teacher has discovered an approach that may revolutionize his approach to lesson preparation and course re-tailoring. Because the wiki is instantly editable, any lesson plan that is overly optimistic about the amount of material to be covered can be changed immediately for the following iteration of the course. If the teacher is worried about unauthorized edits, she can write-protect the wiki. If she wants to keep the content secret, she can read-protect it. If she wants to have certain sections such as quizzes protected, and others editable, this is also possible, depending on the wiki **engine**.

WIKI FOCI AND PROCESSES

Although it is possible to use a wiki without any specific problems, it is useful to have a grasp of some of the already existing conceptual work. This can also help you get more out of wikis.

Wikis imply engagement with ideas

Typically, where a team of people is working on creating a knowledge base of some kind, a wiki implies engagement with information and ideas more than with people, though of course it was ultimately people who produced those ideas. Interaction will generally need to be focused on creating a product, however tentative, and this implies a degree of sophistication on the part of the learners.

It is interesting to compare wikis with discussion forums. A discussion forum emphasizes engagement with others, making it easy to engage in friendly communication that may or may not be related to the main topic of concern. Substantive debate is also possible, but, crucially, the debate is a kind of meta-dialogue, that is, talking about something, but often not creating anything new in a systematic way. A participant is more likely to say "I think you're wrong about that, because …" than to say, "I think you're wrong about that; instead, I would say …". Hewitt (2001) found that it can be very difficult with discussion boards to pull disparate threads together, as one message may simultaneously address multiple issues. Without extra synthesizing steps, for which discussion forums fail to provide specific mechanisms, valuable contributions can be lost before they have been understood for what they are. Reinforcing what we said in the previous paragraph, since a wiki is focused on product (an actual collaboratively generated version of a text), engagement is with ideas, even though those ideas may have been produced by others. As Jennifer Claro suggests, wikis are a cognitive **constructivist** tool in the Piagetian sense, in that they create knowledge from within the learner rather than imposed from outside by the educator (2005, personal communication).

Any activities requiring use of a wiki will typically have to be carefully tailored to learners, and possibly the wiki should be seeded with templates to provide some kind of structure to make exercises easier. **Mind mapping** or flowcharting can often help students develop a structure.

Thread mode for communication

People now are accustomed to seeing Wikipedia as representative of wikis in general. Since Wikipedia is designed to present a friendly face to people visiting briefly to get specific information, it tends to obscure the writing processes that produced the apparently finished article on view. To see what goes on behind the scenes, you can click on the tab labelled *discussion*. What you will find may be enlightening, and perhaps a bit frightening, especially in the case of contentious topics.

However, the earliest wikis were commonly used in thread mode, where a signed contribution at the top of the page is followed by another signed contribution responding to the first, and so on. When a wiki is used in this way, the point about ideas and information being favoured over people may become invalid.

At first sight, this threaded mode may appear to be no more than a discussion forum without many of the functions we have become accustomed to. Yet it has the trivially easy hyperlinking features of wikis, which allow one to refer to other discussions easily. Most importantly, it has the potential to be transformed from thread to document mode.

Where discussions need to take place, but the wiki proper needs to serve simultaneously as a resource for others, users would typically make use of the discussion feature mentioned above, which is now a fairly common feature across wiki engines. Sometimes, this appears in the guise of a comments feature; in WackoWiki, for example, comments are appended to the bottom of a page, in a separate space. Users can choose whether to show or hide a page's comments.

Direct transformation over meta-dialogue

Wikis are sometimes seen as less desirable for discussion than discussion forums. This may well be the case when discussion is the sole or main purpose of instruction. As we have mentioned, the standard mode of use is to attempt to create a page that is a product of some kind, however tentative its status and however many more iterations may appear in the future, as the scenarios below may illustrate.

An advanced user, B, when finding a page authored by another advanced user, A, may, while respecting the intentions of A, alter the text to reflect B's concerns in addition to A's concerns. In many cases, A will infer the intentions of B from the changes, and this understanding forms the basis of a continued collaboration, with A and B engaging in true co-authorship. When users are able to see the creation of a wiki page as a social process, in the sense that they are able to imagine the intentions of their co-authors, wikis can become a social constructivist tool. Of course when co-authors disagree, they may choose to make a phone call or launch a discussion by email, for example; however, in general it seems to us that a large part of wiki interaction consists of a kind of tacit debate, where the debate is in a sense encapsulated in the version changes of the wiki pages. It further seems to us that this is a very efficient way of working and that it would be wrong to conclude that the lack of meta-dialogue is necessarily a deficiency, although it may mean that much wiki work falls outside the scope of strict definitions of collaboration (see Chapter 28, Online Collaboration: An Overview).

A technologically unsophisticated user D, encountering a page authored by a user C, may in many cases feel too intimidated to alter the text in any way and may instead create a totally new page. If this is titled *User D Perspective*, for example, this may be an entirely appropriate strategy. If the pages largely overlap in content, though, and if the relationship between them is not indicated, it creates a redundancy which may never lead to real engagement between the two users, since the wiki does not have the structures in place to push users towards discussion; or rather, although wikis can easily support discussion, this functionality is not foregrounded by default. The emphasis is very much on creating pages, which are works in their own right, ready to be read profitably by others.

Thus, it may be better to avoid wiki exercises with non-advanced users or to make the exercises very limited in scope and pre-structure the wiki to some degree.

Product over process

While co-authoring a wiki page can be a highly collaborative and ongoing process, each time a page is saved it becomes a product. Although this product has the potential for future development, it is nevertheless very much a product in the eye of the casual visitor, and there is an unseen pressure on the authors to make it a "real" product on each page. Although much depends on the purpose of the wiki and the context surrounding its creation, in general the product aspect can be considered as being foregrounded, and this has a subtle effect on the dynamics of the process and the interaction between users. It is up to teachers to decide whether or not this is a positive thing. In general, we consider it overwhelmingly positive, as it focuses attention on incompletions and imperfections.

Note that this does not mean that all problems have to be solved definitively. However, they do have to be acknowledged and defined as far as is practical, and this opens the way for future attempts at completion.

From thread to document mode

It is with relatively sophisticated users that wikis may come into their own, when teachers encourage the use of thread mode initially, but also encourage a process leading to a product in document mode (Bruns & Humphries, 2005; Morgan, 2004). In other words, at first learners respond to each other's ideas on the page as if the page were a thread in a discussion forum, but gradually begin to take ideas from other contributors, from various parts of the page, and merge them into a partial summary or reconciliation of different viewpoints. These summaries serve in turn as raw material for others to summarize or exploit in other ways to achieve a higher synthesis.

> "Wiki goes meta—almost naturally." (Morgan, 2004)

In this process, even signed comments lose any clear authorship and become material for the co-authored text that emerges. Though this process can be difficult to achieve, it is arguably the highest form of collaboration, and serves to demonstrate advantages of wikis over more fully featured threaded discussion forums.

EXTENDED WIKIS

As mentioned above, wikis are not easy to use to their full potential in many educational settings. A large part of the difficulty is a conceptual and attitudinal one. If students do not wish to work together, it will be difficult to use a wiki effectively (Rick & Guzdial, 2006). There may be resistance to the idea of editing another's text. The number of cases where a satisfying transformation from thread to document mode takes place may be quite limited, except where students are mature and there is a pre-existing culture of collaboration (Chapter 28, Online Collaboration: An Overview).

In addition, there a number of difficulties associated with classic wiki engines that may be overcome by enhancements to the software, and we deal with some of these here. We use the term extended wiki to refer to software that is in general functionality and look-and-feel a wiki engine, yet sports enhancements that take it clearly beyond most wiki engines in certain areas. We do not offer a hard-and-fast definition because, as wikis in general evolve, the functionality that qualifies an engine to be classified as an extended wiki is something of a moving target.

Simultaneous edits

Wikis are asynchronous tools in the sense that there is no requirement to be logged in at the same time as other users. This is on the whole a strength, but classic wiki engines can be inconvenient for in-class use because two users may edit the same page at the same time, potentially causing one user's changes to be lost, depending on the relative timing of the respective users' saves. Most wiki engines these days implement some measures to alleviate this problem. PhpWiki, for example, uses special markup to indicate areas where two people have made simultaneous edits between saves, giving the user the chance to reconcile the two versions, usually by merging both edits. MediaWiki allows each section of a page to be edited separately. Neither, however, represents a complete solution to the problem.

Wang and Turner (2004) describe some wiki engine enhancements that they introduced to make wikis more useful and easy to use in their classes. A key one is a simple mechanism to handle concurrent edits: when one student is editing a page and another attempts to edit the same page, a timer appears on the first student's screen. She is expected to save her changes on the page before the timer ticks down to zero, after which her work will be saved automatically, she will be locked out, and the second student gets priority.

Managing cohorts

It is arguably wasteful for each cohort to start from zero. As in real life, it is generally more fruitful in education if each cohort can build on the work of previous cohorts, with collaboration extending across course and time boundaries. This may not always be very convenient for teachers, however, nor satisfying for students, as it is difficult to pinpoint what a specific cohort has done. Another of Wang and Turner's (2004) enhancements offers a partial solution, in the form of a snapshot function that can be invoked at the end of each iteration of the course, archiving the state of the wiki at that time.

Course management

There are a number of features that can aid in course management. Typically, a teacher will want to keep some pages un-editable by students (for example, syllabus details), and perhaps some un-viewable by students (for example, future quizzes). With a classic wiki, the standard solution would be to keep such material off the wiki, finding some other medium to archive or display it. More modern wiki engines provide functions to make alternative media unnecessary.

For example, WackoWiki has access controls that can be customized per page. PmWiki and DokuWiki have a **namespace**s feature which allows certain sets of pages to be made un-editable or even un-viewable, usually by means of password-protection. Wang and Turner's engine goes one better by means of a visibility function, reminiscent of Moodle's hidden function: by switching visibility from false to true, for example, the teacher could create all course quizzes before the start of the course, revealing each one on the day of the quiz.

Media types

Wikis typically are very text-heavy, and in many cases this is a welcome feature when students may spend hours adding pictures, colours, and animations to a PowerPoint presentation, forgetting to prepare sufficient material or to practise what they are going to say. But there may be a legitimate need to include other kinds of media.

Nowadays, many wiki engines can incorporate pictures in some form, usually as attachments that need to be uploaded to the wiki, and then downloaded by the viewer and opened separately. This should be regarded as the minimal requirement, as it is not desirable to require students to keep track of multiple sites or online hubs. Far better is a wiki engine that allows pictures to be viewed within the body of the page. Again, this is no longer a rare feature, but some wiki engines take things further. Of particular interest is WikkaWiki, which allows users to incorporate mind maps created in the open source mapping software FreeMind, in addition to Flash animations. LizzyWiki (Desillets, 2005), an experimental testbed rather than a generally available product, allows files to be attached using syntax similar to that used to create a new page, alleviating one possible difficulty associated with incorporating external resources.

With research students, or those working in mathematics or related fields, UniWakkaWiki may be a good choice, as it supports MathML, for mathematical notation, and **BibTeX** for handling citations and reference lists.

Output

For many projects, the wiki itself is the result of the work in the wiki, and people who wish to view the work can simply be directed to the wiki's URL. In other cases, to emphasize the completed product aspect of the project, print output may be desirable. To avoid arduous copying and pasting, some kind of special export feature is necessary. WackoWiki can export documents in Microsoft Word format, while UniWakkaWiki does the same in OpenOffice format. PmWiki has an optional extension that can create attractive PDF documents.

Structure

While the free-form nature of wikis is one of their biggest attractions, there are times when some kind of structural support could be invaluable, for example when there is a need to create a set of pages of similar format, such as tourist guides to a range of destinations. For beginners for whom simply mastering the mechanics of page editing is challenge enough, it may also be helpful to reduce the field of choices as regards structure. When there are few categories of information, some limited form of hierarchical organization may be useful, and similarly linear arrangement of information can sometimes be the most obvious and helpful way to go.

Linear navigation schemes in wikis are commonly called WikiTrails. PmWiki was one of the first popular wiki engines to offer this feature, and an example of a trail can be found in the PmWiki documentation, starting at Basic Editing (http://www.pmwiki.org/wiki/PmWiki/BasicEditing). In this case, the creators of the site have judged that someone just beginning to explore the functions of PmWiki might first want to know the basics of editing an existing page, then how to create a new page, then how to create links, and so on. In a course website, you may wish to create a trail of short pages introducing lectures in the order in which they are held, or a series of past quizzes for present students to refer to. An important thing to remember about trails is that they are a secondary navigation system overlaid on the basic wiki structure, and can thus be used or ignored by readers as they wish.

Another helpful feature offered by LizzyWiki is optional page templates. These can be applied to any pages that require them, they serve as a reminder to writers regarding what information to include, and they offer some indication as to suitable length.

PmWiki, DokuWiki, and MediaWiki are three wiki engines that offer groups, or separate namespaces. Consider, for example, a course with four or so major topics, each of which features pages like JohnsPerspective, LindseysReaction, and so on. To avoid ambiguity between John's perspective on Topic 1 and his perspective on Topic 2, we might create a Topic 1 and a Topic 2 group. Thus, the two pages would become TopicOne/JohnsPerspective and TopicTwo/JohnsPerspective, respectively.

In a course orientation, or when introducing wikis for the first time, one may have a clear idea of what order would be best for presenting information. One way would be to put all that information on the wiki's homepage, arranged in headings, sub-headings, paragraphs, and lists. Another would be to put only one link on the homepage, so that readers are pretty much forced to follow the prescribed path. Neither of these methods would be ideal, however, for people looking for more specific information.

Ease of use

QwikWeb offers a wonderfully easy entry to wikis. It functions as a simple mailing list, and this is the facet that can be shown to learners initially. Instead of sending an email to several users, the teacher can simply request that emails should be sent to the stipulated qwikWeb address, which forwards emails to list members. However, qwikWeb is also a wiki. After users are accustomed to sending email to each other through the list, the teacher can introduce the wiki URL and then, for example, offer instruction on how to edit an entry or combine it with another.

LizzyWiki recognizes the problems that many users have handling links, and therefore offers a more forgiving syntax, allowing variants like *WikiWord*, *Wiki_word*, and *wiki_word* to all point to the same page (Desillets, 2005). It also extends this same pattern to uploads, such that entering *my_document.doc* will prompt the user to locate a file to upload. Equally importantly, it has a mechanism for graceful recovery from link-related errors, providing a button that renames the current page and repairs all links to the page.

Wikispaces goes even further in facilitating error-free link creation, providing a kind of wizard that prompts the user to choose an internal or external link and then, if the link is internal, giving a list of link targets to choose from. In this it takes a cue from VoodooPad, the desktop software based on wiki links that has long recognized the difficulty of remembering the names of all pages to which one might want to link.

COMBINATIONS AND EXTENSIONS

The extended wikis we discussed in the preceding section, though offering certain extra functions not usually associated with wikis, are still recognizably wikis. The software we discuss in this section go beyond wikis in functionality, and in many cases are not based on any wiki engine. Yet they still have the collaborative editability of wikis and take their inspiration from them. The second group of tools examined here, **blikis**, represents a merging of blog and wiki functions, and we believe these represent an important direction for future development.

Super-wikis and non-wiki collaborative tools

JotSpot is the best known example of what we term **super-wikis**. Though based in the wiki ideas of collaborative editability and instant updateability, the code is different, and the functionality is an order of magnitude greater. JotSpot has various types of fields in addition to plain text fields, and thus, although it can also be used as a standard wiki, it can also serve as a web application development environment.

Wikindx can also reasonably be considered as a super-wiki. At its heart is a database of reference information in BibTeX format that can be freely cross-referenced like a wiki. Winkindx also contains a writing module that references the database.

Collaborative writing applications such as Zoho Writer, Writeboard, and Google Docs are in essence word-processors with a subset of the functions of a desktop program such as Microsoft Word, but running wholly on the Web and allowing multiple users to work on the same document. For more structured data, tools like Google Spreadsheets or Zoho Sheets can be a useful alternative. To a large extent, these tools solve the limitation common to most wiki engines that prevents them from being used for synchronous collaboration, saving any change automatically and almost instantly.

Blikis and Drupal

We argued in the preceding section that blogs are a suitable general-purpose CMC tool for most purposes, and that wikis are best supported or preceded by blogs. An exciting recent avenue of development is software that combines the two types, which we shall refer to generically as blikis, though other terms such as **wikilogs** are also sometimes used.

While blogs typically are suited to quick noting of thoughts and experiences, the writing in wikis tends generally to be the product of deeper reflection, often processing a number of ideas at the same time and coming to a kind of synthesis. In many usage scenarios, a wiki will incorporate many ideas or pieces of information that have previously been talked about on the writers' blogs. If this is the case, then it makes sense to link the two together in software, rather than leaving writers to trawl through their blog archives looking for material.

There are several different approaches to blikis, which reveal interesting differences in the developers' views regarding the essence of blogs and wikis. Here we shall look at a few specific examples.

Wikilogs (http://webseitz.fluxent.com/wiki/) take a wiki as a base and incorporate weblog entries as a special kind of wiki page, named with a yyyy-mm-dd format date. Thus, a subset of the wiki entries is arranged in reverse chronological order like a blog but, because those entries are within the wiki space, they can be referred to easily by other wiki pages, some of which will be topical entries building on the blog entries. Likewise, PmWiki is a conventional wiki engine that allows the creation of blog entries through extensions.

Both the above examples are clear cases of wikis with blog-like features added on. TiddlyWiki (http://www.tiddlywiki.com/) and its many derivatives are rather more platform-neutral, though they are still located on the wiki side of the fence. Items (tiddlies) are small chunks of text rather than whole pages, and a sidebar offers flexible options for viewing content either chronologically or according to content tags or keywords associated with items.

It is possible to have a separate wiki and blog, but linked in a way that approaches bliki functionality. For example, people signing up for an edublogs blog (http://www.edublogs.org) are given a free wiki on Wikispaces. The customized WordPress Multiuser administration controls have a special Wikispaces tab, while Wikispaces admin has a WordPress tab, and wiki updates are usually posted automatically in the blog sidebar.

One package that is not known as a bliki but functions in a broadly similar way, in addition to having discussion forums and offering multi-blog installations, is Drupal (http://www.drupal.org). In Drupal, users would typically have their own blogs, while the wiki-type functionality lies within the book module. This is different from a real wiki, in the sense that there is no wiki-style linking system. Instead, pages are created and then arranged in a linear and hierarchical structure. Similarly to a wiki, typically all users can edit the pages in a book, as well as manipulate the structure of the book. Blog entries and book pages, as well as other content, can have keywords associated with them. Clicking on a keyword attached to one blog post, for example, will show all items of any kind with that keyword. Thus, the blog and wiki-like entries are part of the same seamless space.

WIKIS AND USABILITY

We conclude this section on wikis by broadening our focus to usability. This issue is relevant to all educators seeking to introduce new technologies, but it is arguably of particular concern with wikis, because software-related difficulties may be entangled with conceptual or attitudinal issues. In other words, the nature of the tasks that learners are expected to perform may be unfamiliar or be at odds with learners' expectations or preferences, while at the same time more mechanical issues such as how to create hyperlinks may be a source of difficulty. By finding out what aspects of the software **interface** cause problems for learners, and focusing our initial instruction on these aspects, we can create some space for addressing directly the wider issues surrounding the use of wikis and other collaborative software. Ultimately, we can find ways to improve the software to alleviate these problems.

Lavin and Tomei (2006) attempted to isolate usability factors by giving pairs of wiki novices deliberately trivialized tasks to perform, and observing the wikis they created, trying to understand the difficulties by means of think-aloud protocols. Though we were only partially successful, we discovered that linking was a task fraught with difficulty, students forgetting where the Edit button was, and making all manner of errors with **WikiWords**.

Training can no doubt overcome these problems, but there clearly is scope for improvement in the software, if we are going to use it widely with novices. Desilets (2005) concluded that requiring novice users to use raw wiki syntax to manipulate wiki links is not appropriate.

The Lavin and Tomei (2006) study showed that the effort involved in creating syntactically correct links led one pair of students to create a page which consisted wholly of one link, leading to a page consisting wholly of one link, which in turn led to another page consisting wholly of one link. It did not seem to occur to the students that content other than links might profitably be included.

The above examples are extreme, and we should not lose sight of the fact that wiki syntax is indeed easy when compared to HTML, for example. However, as a general rule, it is probably dangerous to assume that any computing task will be easy for all learners, however trivial it may seem to us. When software makes tasks complex, the frustration often makes it impossible to concentrate adequately on the central task at hand, thus destroying any chance at achieving a state of flow (Csikszentmihalyi, 1990), when learners can be at their most productive and absorbed in the activity.

Several projects address usability issues with wikis. LizzyWiki (http://lizzy.iit.nrc.ca/LizzyHelpNew/public/wiki.cgi), developed at the National Research Council of Canada, is a leading candidate for educational use, partly because of the thought that has gone into removing some of the stress associated with linking, though at the time of writing it was not yet available to the general public. MediaWiki now has eliminated CamelCase as a linking mechanism, requiring double pairs of square brackets instead. Though this is arguably slightly more time-consuming, it may prove to have some benefits in terms of ease of use.

CONCLUSION

The length of this section on wikis reflects the great importance that we attach to wikis, partly as tools in their own right, and partly as lenses on a wide range of issues including usability, the nature of collaboration, and ways in which technical aspects of e-learning tools can become entwined with wider issues of deployment. Such issues may be part of any new tool, but the collaborative editability of wikis brings them to the fore, and teachers deploying wikis may wish to reflect on their goals as well as the extent to which they are willing to embrace new technology and work practices.

Digital storytelling

by David Brear with Joseph Tomei

INTRODUCTION

Digital stories are a natural in any classroom, whether filled with young children or adult learners. The concept is very easy to understand. Students and adults love to tell stories. Stories can be about family, friends, or favourite things; anything that relates personally to the teller can be grounds for a powerful story. Once students have the idea, they can plan a story, create it electronically, and share it with their class or the world.

This section on digital storytelling provides implementation tips, educational uses, and examples, while guiding the reader through the steps to creating digital stories with students: drafting a proposal, creating a story outline, and producing a digital story. Since stories find their most natural home with children, we will begin with that audience in mind, and follow on with ideas for adaptations for other groups of learners.

WHAT IS DIGITAL STORYTELLING?

> "People did not wait until there was writing before they told stories and sang songs". – Albert Bates Lord (Lord, 1995, p. 1)

Add the use of technology, and storytelling goes digital! There are many forms of digital storytelling that may combine any of the following elements: text, image, sound, voice, and moving images in a coherent story. It is the interplay of these unique elements that gives this medium its power. However, no amount of digital magic will turn a poor story into a good one.

By examining how to introduce digital storytelling to students in Grades 7 and 8, we can see the differences and similarities between modern multimedia methods and oral traditions of sitting around an open fire passing on valuable family stories from one generation to the next. This section will underscore the connection between the two.

Today, we can turn the classroom into an environment where students relate what is important to them using the digital tools that are available. It might be holidays, friends, family, an activity, an idea, sports, or something else they choose. When I work with students, I mention to them that each digital story is unique and that each student brings something special to their own stories. It is gratifying to watch their faces and their eyes light up as they then think about an idea. It is this power, the primal power of storytelling, that makes this useful and appropriate for the classroom.

DIGITAL STORYTELLING IN THE CLASSROOM

Digital storytelling can contribute to the development of many of the **competencies** we want our students to acquire. While Chapter 28, Online Collaboration: An Overview, discusses collaboration with an emphasis on adult learners and higher education, the present section provides an example of such collaboration among young learners. However, since many of the same principles apply, it is important to realize that digital storytelling for younger students offers an initial jumping off point for these principles, because it is an ideal environment in which students can work in teams and learn to collaborate on decision-making and task accomplishment throughout the planning, production, and post-production phases of their digital stories. These interactions are crucial to acquiring knowledge as well as developing multiple learning styles.

A further strength of digital storytelling is that it can be used to integrate subject area knowledge in many areas of the curriculum because those who can tell a story understand the subject: their knowledge is not merely a recitation of facts or events, but knit together by an underlying narrative.

> "To be a person is to have a story to tell". – Isak Dinesen (Maquire, 1998, p. 37)

Benefits to learners

There are two kinds of benefits that learners realize when engaging in digital storytelling. The first is the kind that accrues from the use of stories. When younger students realize that their stories are valued, and of interest to their instructor and peers, they experience an increase in self-esteem and confidence. Another perspective on this kind of benefit that may be more salient to older learners is learning that the information they incorporate within their stories is embedded with a framework of their own experiences, which leads to deeper learning and greater retention.

The second kind of benefit is technological: students tell their stories while developing a familiarity with computer software and protocol. This serves to anchor this knowledge into a framework that is useful for students and will be for years to come.

Benefits to instructors

There are multiple benefits to instructors. Stories help instructors learn more about the students, which allows instructors to fine-tune teaching and intervention. In addition, instructors may learn as much as, or more than, the students with regards to the various uses for multimedia. Moreover, because instructors will be able to promote learning through peer relationships, everyone becomes a teacher and a learner simultaneously.

GETTING STARTED

For younger students, the idea behind a digital story is that it should be about something that is important to the student. So asking them to choose a suitable topic should be the first step in a digital story.

After students have been introduced (if need be) to the basics of using computers, you should ask them to begin to collect materials, using a digital video camera or a scanner for visual materials, and a recorder and their favourite music for the audio materials.

At this point, it is a good idea to introduce existing digital stories to the students. Obviously, when you first try digital storytelling in the classroom, you will not necessarily have examples to hand, so accessing examples at sites like Seven Elements of Digital Story Telling (http://t3.k12.hi.us/t302-03/tutorials/digstory/elements.htm) and DigiTales—The Art of Telling Digital Stories (http://www.digitales.us/resources/seven_steps.php) can provide starting points. These sites provide a series of steps that you can adapt to your own teaching situation, as well as a wealth of other information about digital storytelling.

After showing examples, I ask students to plan their digital story around a story they want to tell and ask them to write out their script to be combined with the visual and audio materials they have collected. A progress chart to allow students to document their progress is a useful device. It is also useful to give students a concrete idea of how their projects will be evaluated. One example is given below:

Create Your Digital Story, to include:

Script, written and shown to Mr. Brear (30 marks)

and any 5 of the following:

Voice (10 marks)
Digital Imagery (photos) (10 marks)
Text (titles) (10 marks)
Music (10 marks)
Video (10 marks)
Sound (10 marks)
Animation (includes transitions and effects) (10 marks)

Spelling, Originality, Attitude, Cooperation (10 marks)
Finished Product (10 marks)

Total 100 marks. Your Mark ________

Source: http://members.shaw.ca/dbrear/DigitalStoryProjectGr.8.pdf

Brainstorm ideas

Having students write down their ideas on paper in a brainstorming session is an important activity. Yet I also have had success developing **brainstorms** with a software program called Inspiration (http://www.inspiration.com/). For more information about using concept mapping software in general, and Inspiration in particular, see Inspiration and Concept Mapping (http://members.shaw.ca/dbrear/inspiration.html).

At this stage, it is important not to censor student ideas, and it is equally important that the students don't censor themselves. Remind them that it is much easier to delete things at a later stage, but difficult to create a story if there is insufficient material.

Once the students have decided on a topic and gathered some ideas, it's time to put those ideas into linear form. They do so in a process called **storyboarding**.

Storyboard your ideas

A storyboard is a visual script of the story and is an important part of the planning process. Creating one provides an organizational tool to make the production process flow more easily.

Depending on the elements the students have at their disposal (image, text, soundtrack(s), motion) the storyboard will be more or less complex. In determining the appropriate level of detail, consider whether the final product will be a printed page, a multimedia project on computer, or a video. The output will also determine what your storyboard needs to include. It may include any or all of the following:

- sketches for a page, screen, or scene
- text that will appear on the screen or page
- scripts (for live actors)
- appearance of text (colour, size, font)
- narration
- sound effects
- music
- descriptions of movement
- interactive elements (for onscreen buttons)
- notes on props, location

Tip
Make sure you have a storyboard for each page, scene, or screen of your project. Number your scenes and pages.

Write your script

A script is simply the words used to accompany the digital images of the story, and creating it at this point will help students plan the development process. Students should have an idea of who the audience for their stories will be, as well as some idea of the *dramatic question*, a notion from dramatic theory. Some examples drawn from A Dramatic Question (http://www.storycenter.org/memvoice/pages/tutorial_1b.html) include "Does the guy get the girl?" or "Does the hero win?" When the question is answered, the story is over. A blank template for a simple script can be found at Script Template for Digital Story: Grade 8 Explorations (http://members.shaw.ca/dbrear/dsvvscript_template.pdf).

We suggest that students write one or two sentences that would require about 20 seconds of recording time, which seems to be the most comfortable in terms of recording one's voice over a clip. Our blank template has 10 cells, so filling all of them gives the students a three-minute digital story, though an initial attempt might be better at about two minutes, with no more than 20 images.

Collect materials and resources

When you ask students to collect materials, let them know that these can be Internet-based, collected from home, handed down from an older person to a younger person, folklore, pictures, or even letters from family members. The more materials students collect, the more they will have to draw on for their digital stories.

Slow and steady wins the race

It is important to start off slowly. Have students refer frequently to their storyboard and script as they develop it. The process will naturally take time as they put the pieces together. Computer movie software allows students to film different parts, save them, and scan pictures for inclusion. Have students screen their own and one another's work and then re-edit it. Point out that movies undergo multiple edits and screenings.

> "Don't say the old lady screamed—bring her on and let her scream". – Mark Twain (Carroll, 2002, p. 87)

Start putting your digital story together

Because any story delivery has to be linear in regards to time, approaching the project as a linear timeline is helpful. Therefore, ask students to scan and place pictures into a sequence that relates to their storyboard and script, and then add the music tracks that they have chosen to accompany the images. Next, have the students practise laying the voice track in the appropriate places. Finally, students should create and insert their video clips into the proper sequence.

> "The essence of cinema is editing. It's the combination of what can be extraordinary images of people during emotional moments, or images in a general sense, put together in a kind of alchemy". – Francis Ford Coppola (Cristiano & Letizia, 2006, p. 26)

At all points, encourage students to test their stories as they develop them, sharing ideas and products with their peers. Also encourage them to be open to suggestions for improvement from everyone, because the process of giving and accepting feedback is as important as the final product.

> "I suppose film is distinctive because of its nature, of its being able to cut through time with editing". – Oliver Stone (Kreisler, 1997)

An overview of the process

The chart below, from *Seven Steps to Create a DigiTales Story*, provides a visual guide for the creation of digital stories. Note the division of the production into three distinct phases: pre-production, production, and post-production.

COMPUTERS, SOFTWARE, AND EQUIPMENT

If this discussion has whetted your appetite for digital storytelling, then it is time to take stock. It is obviously not possible to review all of the possible configurations of computers, so making a list of your hardware and software is the first step in determining what is possible.

(1) Does the computer have USB ports and a DVD or CD-ROM burner?
(2) What type of access do you have to a network, and how easy is it to post, distribute, or share projects?

The following are all good programs for creating a digital story.

- iMovie (Apple Computer)
- Microsoft Movie Maker
- Broderbund Telling Stories Basic

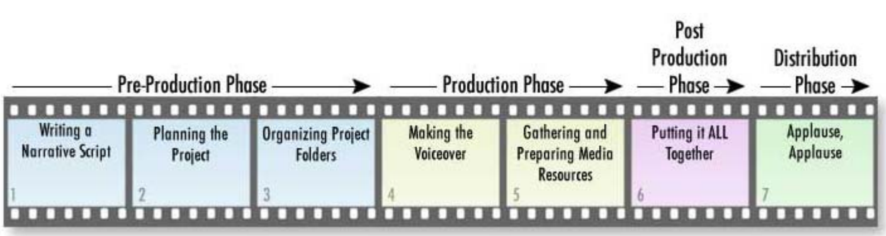
Tip
Apple's iMovie site has a range of iMovie-specific art, sounds, downloadable plug-ins, and assorted other resources.

Tip
Microsoft's Movie Maker site (http://www.microsoft.com/windowsxp/using/moviemaker/default.mspx) has Movie Maker tutorials, tips, and downloads.

Tip
Broderbund's Telling Stories Basic (http://www.broderbund.com/) focuses on creating a digital scrapbook based around a personal reminiscence, making it useful for oral history projects, especially within families or communities.

Another useful tool is a scanner to scan photos of family, friends, and scenes for use in the digital story. Powerful and evocative projects can be created with a simple combination of individual still photos, background music, and voiceovers, as was demonstrated by Ken Burns' *Civil War* series. In a pinch, a digital still camera or a video camera can serve as a scanner.

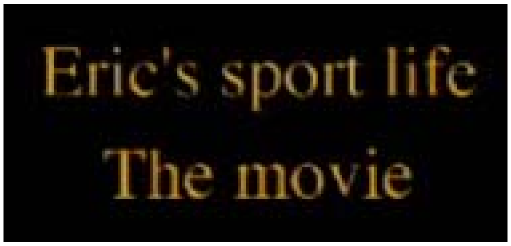
Digital music can be used, but even if you don't have the equipment to access and transfer digital recordings, a microphone can record music or voiceovers.



Source: Seven Steps to Create a DigiTales Story (http://www.digitales.us/resources/seven_steps.php)

EXAMPLES

One example is given below, but you can view a wide range of student made stories at Digital Stories (http://www2.sd43.bc.ca/banting/Web%20Pages/dstories.html).



Eric's story

When looking at those example stories, please don't view them as rigid templates that need to be slavishly adhered to, but as seeds to see what you and your students can develop.

DIGITAL STORYTELLING FOR OLDER LEARNERS

We find that younger learners often have fewer inhibitions about creating digital stories, while older learners may encounter affective barriers in creating digital stories, thinking them childish. There are several reasons for this. Older learners already have an identity in which they have invested (see Chapter 29, Identity in Online Education, for discussion of this). Older learners are more cognizant of the separation between one's private life and what one shares within the classroom. Finally, the general pattern of modern institutionalized education has been to discount more creative, individual ways of learning in favour of mass education. None of these barriers is insurmountable, and there are a number of tactics for getting older learners over the hurdles, but only if you are willing to reexamine your role within the classroom. Furthermore, many of the points discussed previously can be recast for use with older students, often through the use of a Socratic dialogue to get students to develop these notions independently.

Create an external objective

While younger students will often engage in digital stories for the sheer fun of relating their own stories, older learners will often be more reticent about relating personal details about themselves. Rather than rely on the student's own interest, share with older students the reasons why you want them to do this. Some students may view the teacher's role as simply providing the information that they need to learn, but a project draws its strength from having the students provide information for the class to share and learn from.

The play's the thing

Long a staple of literature classes, the class play can easily be updated to be a digital effort. Have students understand that by creating a digital version of the play, or even a part of the play, they will better understand the underlying narrative. Even these shorter versions can contain the power to impress and awe. The Reduced Shakespeare Company, a three-man troupe, has caught the attention of audiences world-wide by performing condensed versions of Shakespeare's plays. While presented humorously, the troupe's performances underline the idea that simplified storylines can lead people to a fuller appreciation of the Bard. That same approach can serve you and your students well.

The digital recitation

Imagine asking a class of students to recite a poem that was assigned by you. Student after student trudges up to the front of the class, while the rest of the class yawns in boredom. Some students are unprepared, leading to further wandering of attention. Now imagine that you ask each student to create a digital version of the recitation by simply creating a PowerPoint presentation of images that they move through as they recite the poem. Now imagine students using a program such as Profcast (http://www.profcast.com/) that allows them to record their recitation in sync with the PowerPoint presentation. This enables a radical change in workflow, allowing you to screen student assignments before class, choosing the best three, for example, and have students discuss which of these is the best. This concentration of effort and attention provides a focal point for both teachers and students.

The story behind the story

Digital stories are not simply for language arts. For students studying science, a digital story describing how a discovery or invention came about allows students to not only gain a better understanding of the process, but allows them to restore human elements to technical subject matter.

Digital stories as timelines

A digital story represents a narrative that must necessarily be told over a stretch of time, and as such it represents a wonderful opportunity for students to present actual historical timelines as narratives that they construct, illustrated with appropriate images.

Digital stories as group projects

We can often depend on younger learners to develop their own stories individually; with older learners, permitting them to produce their story as a group project allows them to draw on their collective resources and promotes class cohesiveness, while increasing opportunities for peer-to-peer learning to take place. A fortunate byproduct of this is that it reduces the evaluation burden on the classroom teacher. Rather than a load of 32 individual projects to review and grade, groups of four reduce that to a manageable eight projects.

Digital stories as an upward spiral

Conducting digital story productions over a longer period of time with consecutive classes permits teachers to select the best work from previous classes and present them as exemplars for subsequent classes. In this way, the bar is constantly raised, challenging students to match and surpass the productions of the previous year's students.

CONCLUSION

We hope that we've given you some ideas to take storytelling into your classrooms. A further source of inspiration is in indigenous traditions of storytelling. For example, in Japan, children are often the audience for *kami shibai*, or paper theatre, where large pictures are displayed as backgrounds while portions of the stories are read. These are ideas and traditions of narratives that can be tapped into to make digital storytelling a natural and enjoyable part of your classes.

Chapter summary

> "Teachers are expected to reach unattainable goals with inadequate tools. The miracle is that at times they accomplish this impossible task". – Dr. Haim G. Ginot (Ramsey, 2006, p. 96)

In this chapter, we have presented three tools that, while technologically advanced, are still being perfected. Both blogs and wikis are specific software applications, while digital stories rely on a combination of software and hardware. These tools will not do everything that you need them to do, but that may be mainly because what we need them to do changes so rapidly.

In reviewing this chapter, a profitable way to examine it is to view the contents as a possible path that students might take to negotiate an online learning environment. Following the chapter on learner identity, we see learners establishing online identities and then learning to interact with other students, noting the problems and possibilities as we introduce various activities, from responding to and creating narratives in the form of storytelling, to creating their own personal narratives through the use of blogs. We also see learners beginning to collaborate with other students to create repositories of knowledge through wikis.

In all this, the educator stands as a guide on the side rather than a sage on the stage, setting up appropriate scaffolds to support learners, trying to minimize the number of dead-ends that learners encounter, and guiding them beyond those that they do. To do this, educators have to embrace learners' perspectives, in effect, becoming learners themselves. In this sense, students, by going through the process, *teach* teachers. In all of this, learners and teachers alike ideally are all engaged in and committed to building and continuously renewing communities of practice, the subject of Chapter 30, Supporting E-learning through Communities of Practice.

Before reading on, we urge you to spare a moment to reflect on the speed at which our notions of online environments change. For instance, in Beatty's fairly recent (2003) book on educational technologies for language learning, technologies such as wikis and blogs, central foci of this chapter, receive no mention. The coming years will no doubt see the arrival of new technologies, some of which may supplant those in use today. While we forefront specific technologies in this chapter, we hope that readers will continue to reflect on the underlying themes of engagement, identity, narrative, communication, cooperation, and collaboration, which remain important whatever tools and techniques we choose to use.

Resources

This is a list of resources for readers who wish to explore further the topics in this chapter.

BLOGGING

Well-known blogging engines include WordPress and TextPattern. WordPress MU is the multi-user version of WordPress, used when you want to install the software once and have several users, each with their own blog. Drupal, although a more broad-based content management system, is also good as a multi-user blogging engine.

Unless you have time and a certain amount of technical expertise (or good tech support), we recommend free hosted blogging services. There are several of these, but because of mergers occurring and new companies entering the market, it is not possible to present a list that will remain current or be exhaustive. At the time of writing, the following selection of services is available. Nevertheless we encourage readers to use a search engine to search anew for “free blog services”.

Commercial blog services

- Blogger—the largest blog service is now owned by Google, which means that Gmail, Google’s free email service, is the easiest route in.
- Wordpress.com—As the name suggests, this service is closely affiliated with the WordPress blogging engine.
- More details can be found at Wikipedia (http://en.wikipedia.org/wiki/Blog_hosting_service).

Educational blog services

These are blog services that use one of the major blogging engines, but are designed for a specific educational niche:

- Edublogs—a service which uses the WordPress MU blogging engine, created to offer blogs specifically to educators and students. Although Edublogs originally were designed for teachers and education professionals, there also used to be blog subgroupings designed for specific student needs, such as for university students and for learners of English as an additional language (Uniblogs and ESLblogs).

Other blogging services with which students may already be familiar

These services, recently called **social network sites** (Boyd & Ellison, 2007), may not be suitable for classroom blogs, but students may have individual experience with them. They include:

- MySpace (http://www.myspace.com/)
- Xanga (http://www.xanga.com/)
- Live Journal (http://www.livejournal.com/)
- Windows Live Spaces (http://spaces.live.com/)

There are a number of social networking websites that have blog-like features. For an up-to-date list, please see Wikipedia (http://en.wikipedia.org/wiki/List_of_social_networking_websites). Educators in other countries who are technically advanced, but do not use English as a general means of communication, may also have SNS in their own vernacular. In Japan, Mixi (http://mixi.jp/) and in Korea, Cyworld (http://www.cyworld.co.kr/ US page at http://us.cyworld.com/), are two such sites.

Photo sharing and image hosting services

This field is in a constant state of flux, so we will only recommend a few sites. Also, because many sites do not monitor images, we urge some research before choosing a service. The ones listed below do monitor images, and they are:

- flickr (http://flickr.com/)—a service that now belongs to Yahoo! If you have a Yahoo! ID, joining flickr is quite simple, but can be a bit more complicated if you don’t. However, Yahoo! offers the simplest interface for including pictures in blog posts;
- photobucket (http://photobucket.com/)—a free, independent service;
- zooomr (http://zooomr.com)—offers geotagging of photos and unlimited uploads

Also, many of the social networking websites (mentioned above) include image hosting as an option.

WIKIS

The wiki field is not as well-endowed as that of blogs, though several useful services exist. Newcomers to both blogs and wikis might wish to take advantage of the chance to get a free Wikispace with a new Edublogs accounts. Augar, Raitman & Zhou (2006), Mindel & Verma (2006), and Tomei & Lavin (2007) provide recent accounts of wikis. Please see the references for details.

Two current wiki-related projects:

- WikiEducator (http://www.wikieducator.org/)—free e-learning content repository
- Wikiversity (http://en.wikiversity.org/)

> “Wikiversity is a community for the creation and use of free learning materials and activities. Wikiversity is a multidimensional social organization dedicated to learning, teaching, research and service”. – Wikiversity (Wikiversity: Main Page, June 29, 2007)

Wiki sites

You first may wish to get students acquainted with the concept of a wiki by asking them to contribute to public wiki sites. However, as the person responsible for bringing students into the wiki, you have some responsibility that they behave and exhibit good netiquette. All of these sites use the Mediawiki software, so they have the same look and feel as Wikipedia:

- Wikipedia (http://en.wikipedia.org/wiki/Main_Page)—thought of as the exemplar of wikis, it has so many users that it may be difficult to have students participate in a protected way. The URL will take you to the English language Wikipedia, and Wikipedia in other languages are linked to from there.
- Wiki Travel (http://wikitravel.org/en/Main_Page)—a wiki that seeks to provide travel/tourism information for locations all over the world.
- Wikibooks (http://en.wikibooks.org/wiki/Main_Page)—a wiki that works to create open source textbooks.

Wiki engines (software that you install on a server to run a wiki)

- Mediawiki (http://www.mediawiki.org/wiki/MediaWiki)—the software that powers Wikipedia, handled by the non-profit Wikimedia Foundation. Immensely powerful, but with a steep learning curve.
- LizzyWiki (http://lizzy.iit.nrc.ca/CrossLangWiki/public/ywiki.cgi)—a wiki engine specifically designed to deal with bilingual and multilingual sites. Still in development, but something to watch for.
- Moodle wiki module (http://docs.moodle.org/en/Wiki_module)—integrates wiki features with Moodle LMS functions.
- PmWiki (http://pmwiki.com/)—a very user-friendly engine to install and use. Has a very active user community and many extensions written by users for extra functions. More details at pmwiki.com.
- UniWakkaWiki (http://uniwakka.sourceforge.net/HomePage)—This engine is ideal for math and science wikis because it can display formulas and bibliographic references generated with MathML and BibTeX. Suitable for collaborative publication of printed materials as it can export to LaTeX.

Free wiki services

- Wikispaces—based on the Mediawiki engine, found at http://www.wikispaces.com/. You can get a wikispace included with an edublogs account or go directly to Wikispaces for Teachers: http://www.wikispaces.com/site/for/teachers. Non-paying users are limited to 2Gb of storage.
- PBWiki (http://pbwiki.com/)—a free wiki service, limited to 10Mb for non-paying users, that uses ad-support to cover costs.
- JotSpot (http://www.jot.com/ and http://www.jotlive.com/)—a pay service that also offers a free wiki service, with restrictions on storage and numbers of users and pages.
- EditThis.info (http://www.editthis.info/wiki/Main_Page)—this site uses the Mediawiki engine, so it has the look and feel of Wikipedia. It permits administrator control and currently operates via donations.
- Wetpaint.com (http://www.wetpaint.com)—this site allows you to create a topic-specific wiki (or contribute to a pre-existing one). Note that you cannot create closed communities with this service: anyone with an interest in your wiki's topic can contribute. Though tracking learners' contributions may be hard, this is one of the most authentic ways for learners to contribute knowledge to the global community of Internet users.
- SeedWiki (http://www.seedwiki.com/)—another service with free and for-fee levels of service, the latter allowing password protection and other advanced features.
- The wikipedia entry on "Comparison of **wiki farms**" (http://en.wikipedia.org/wiki/Comparison_of_wiki_farms) has a list of these and other services.

Online writing software

Online writing software is used to create web-accessible documents, to either display individual work or, more interestingly, for collaboration over the Internet. Examples are:

- Writeboard (http://www.writeboard.com/)—this software, from 37signals, was, as far as we can tell, the first of its kind. Users can create an unlimited number of Writeboards free of charge and with an unlimited number of co-authors. Alternatively, Writeboard can be used as part of the pay service, Backpack.
- Google Docs and Spreadsheets (http://docs.google.com)—in March, 2006, Google purchased the startup Upstartle and its online word-processing software Writely. Subsequently, Google incorporated the service into Google Accounts and added Spreadsheets and a PowerPoint-like Presentations module. Documents created can be kept completely private, shared with specified individuals, or published either to a Blogger blog or to the Internet at large with a google.com URL.
- Zoho Writer (http://www.zohowriter.com/)—an option for online writing, part of an extensive suite of online software, including presentation software, spreadsheet, groupware, project management, and more.

DIGITAL STORYTELLING

- The Multimedia Project's The Video Guide—a resource for both students and teachers to use as they explore the world of video. Containing four categories, the materials include such assets as advice sheets, activities, and glossaries (http://pblmm.k12.ca.us/TechHelp/VideoHelp/VideoGuide.html)

- Visual Knowledge Project—highlights some of the resources on digital storytelling which are available online (http://crossroads.georgetown.edu/vkp/newsletter/0902/resources.htm)
- The Complete Eejit's Guide to Movie Making—focuses on storyboarding from the artist's perspective. It has some excellent tips on how to indicate camera directions from within your storyboard (http://www.exposure.co.uk/eejit/storybd/index.html)
- Storyboard Organizer—a simple step-by-step approach to creating a storyboard (http://www.thirteen.org/edonline/lessons/storyboarding/)
- Royalty Free Resources—a guide to royalty-free resources. (http://www.pembinatrails.ca/program/technology/royalty_free_resources.htm)
- Digital Storytelling—a resource for students and educators who are engaged in learning through digital storytelling. (http://www.wsd1.org/digitalstorytelling/)
- Digital Story Telling Education—introduces the Digital Storytelling project, a library for Broadband schools in the East of England Broadband Region and other Regional Broadband Consortia. You can search and access digital stories. From this site you can also learn how to create your own digital stories, understand more about copyright and access further digital story resources from the Links section (http://story.e2bn.net/)
- Digital Story Telling—an extensive list of resources including articles, samples, and workshops (http://members.shaw.ca/dbrear/dst.html)
- Digital Storytelling: Capturing Lives, Creating Community (book) by Joe Lambert (2nd ed.), with updated resources (http://www.storycenter.org/book.html)

Glossary

Accidental learning. Learning that is unplanned by both the teacher and the learner.

Alternative assessment. Alternative means of enhancing educational assessment through, e.g., confidence measurement, analysis of self-awareness, and performance evaluation.

Asynchronous. A term used in computer-mediated communication for tools such as email, bulletin boards, blogs, and wikis, for which it is not generally assumed that responses will be immediate. Contrasted with synchronous tools such as chat.

Authentic assessment. A process that involves examining students' basic skills, control of information, high level of understanding, personal characteristics, and habits of mind; and it allows students to participate actively in their own learning.

(Pre-) authentication. A process which determines whether, for instance, educational materials actually serve intended purposes, for particular learners or groups (before they encounter or use such materials); a counter-example: early childhood education case studies for present or future adult educators (see **Authenticity**).

Authenticity. A term used to measure to what extent a task used for educational purposes represents tasks that learners might have to perform outside the formal educational system.

Avatar. An image used to represent a writer or participant. An avatar can be an actual picture, a caricature, or even an unrelated image that is used consistently to represent the writer or participant.

Backlinks. Also referred to as inbound links, this term refers to all the links to a given web page. Some implementations are known as linkback or trackback. Having bi-directional links is often considered one of the keys to realizing the original vision of an interactive**, read-write web**.

BibTeX. This is an electronic format for bibliographic information, readable by most specialist reference management software (such as EndNote or Bookends) and online reference management services (such as CiteULike or Connotea). It was originally designed for use with LaTeX typesetting systems.

Blending. Using a variety of teaching and learning methods, a range of tools, synchronous and asynchronous computer-mediated communication in addition to face-to-face meetings, and a combination of individual and collective activities.

Bliki. a software program that shares properties of wikis and blogs. Implementations differ according to whether wiki or blog functionality is considered primary.

Blog/weblog. A website that consists generally of date-ordered entries, from newest to oldest, that can be added to or edited via the Internet.

Brainstorm. A method by which any and all ideas are put forward freely, for review at a later stage. Useful for compiling a list of keywords and identifying main concepts.

Camelcase/CamelCase. The practice of writing compound words or phrases where the words are joined without spaces, and each word is capitalized within the compound. The name comes from the uppercase "bumps" in the middle of the compound word, suggesting the humps of a camel (e.g., MaySchedule, Start-

Page). Used in most wiki engines to create new pages (and link to them) or link to already existing pages.

Cohort. A group of students taking the same class or at the same point in a curriculum.

Collaboration. Working together with complex interactions and high interdependence among learners.

Comments. A feature of most blog software, allowing short remarks or long conversations to be appended to a blog post.

Competency-based assessment. The assessment of abilities vis-à-vis standards set for knowledge and skills in a particular area, typically used in vocational education and professional certification processes.

Computer-mediated communication (CMC). Any kind of communication between people carried out with the use of computers. Tools typically used for CMC include email and chat software, blogs (weblogs), and wikis. Of these, chat is usually called synchronous CMC, because responses are usually almost instantaneous, and the others are examples of asynchronous CMC, because responses are often time-delayed.

Constructivist. A psychological theory of learning that knowledge is constructed, and continuously reconstructed, actively by each individual, based on interaction between knowledge that he or she already has, as well as new information. Serves as a partial explanation of the phenomenon noted by many educators that students don't always learn what teachers teach (Allwright, 1984).

Cyberspace. The space in which interactions take place on the Internet, a metaphor which permits an understanding based on interactions in "real space".

Disidentification. A characteristic of online identity which combines aspects of anonymity and pseudonymity.

E-portfolio. A collection of authentic and diverse evidence, drawn from a larger archive that represents what a person or organization has learned over time, designed for presentation to one or more audiences for a particular rhetorical purpose.

Editability. A feature of wikis and Web 2.0 software that allows previously written/saved information to be changed.

Enculturation. A process whereby members of a group deepen their sense of belonging and come to accept group norms for participation.

Engine. The part of a software program that works "under the hood", providing its functionality; distinguished from the interface.

Entry page. The page that a visitor to a site will usually see first (unless entering from a search engine that takes the visitor directly to a page with specific content). It is important that the entry page offers easy paths to most of the pages that a visitor is likely to want to see.

Facilitator. In formal educational settings, typically a role that many constructivists suggest teachers should adopt; rather than simply giving information to students, teachers should support students in their attempts to construct new knowledge.

Flexible assessment. A form of assessment that can include any of the following: checklists, portfolios, performance tasks, product assessments, projects (undertaken in groups or individually) and simulations, observation of the learner, questioning, oral or written tests and essays, role playing, work samples, computer-based assessment; flexible assessment is intended to suit learners' paces and styles of learning and assess individuals when they are ready.

Forum. A location in cyberspace, sometimes called a board or bulletin board, where people can exchange information or opinions.

Hierarchical structure. A clear, levelled information structure, where everything at a lower level is part of, or belongs to, only one unit at a higher level.

Human capital management. Identifying and managing what a person or a group of people knows and can do, rather than relying on credentials.

Hypertext. Text containing hyperlinks that allow the reader to easily access supplementary or connected information or citations.

Hypertextuality. The property of text, especially on the Internet, that allows it to be linked to other text.

Incidental learning. Learning that is not the teacher or curriculum's goal, but is something that is expected to be acquired.

Informal learning. Learning which is generally outside of the classroom but still with expected outcomes, with typical examples being activities such as mentoring.

Instant updateability. The property of wiki-based, and some other, websites that allows minor changes to be made in place and very rapidly; contrasted to conventional websites where typically a change would be made on a personal computer and then uploaded to the remote website.

Interface. The way a user interacts with a particular website or software. The interface is often posited as a separate entity that can either aid or hinder a user.

Mind mapping. Creating diagrams, usually fairly simple and often multi-coloured and rich in images, that represent semantic or other connections between pieces of information. It is often recommended as a way to plan lessons, and also for learners to take notes on lectures, and so on.

Moblogging or mobileblogging. Blogging by posting text entries and/or pictures from a cell phone. As laptop computers and public wireless connections become more common, this is coming to mean any blogging that takes place in a temporary location.

Moodle. An open-source course management system, or learning management system, popular as an alternative to commercial systems such as Blackboard or WebCT.

Namespaces. A method of grouping in a wiki. In wikis, page names generally are unique. Using namespaces ("groups" in the parlance of some wiki engines) a wiki can be divided into semi-independent areas, and a page name in one of these areas can be the same as that in another.

Prior learning assessment. A process of exploring, determining, and recognizing an individual's non-formal and informal learning for the purposes of formal recognition in academic environments, or appropriate employment.

Read-write web. The subset of the Web that is editable by readers, conforming more closely to Tim Berners-Lee's original vision (1999) than the predominant model of information producers and consumers.

Social network site (SNS). An Internet enterprise that permits users to share information with other members of the network for the purpose of social interaction. Some examples include MySpace and Facebook.

Storyboard. A set of illustrations displayed in sequence for the purpose of pre-visualizing an animated or live-action film or other form of digital story.

Super-wikis. Software (usually a web service) that has the collaborative editability and instant updateability of wikis and major additional functionality. The developers may or may not use the word wiki in describing the software or service.

Synchronous. A term often used in e-learning and computer-mediated communication for chat and other communication systems where responses can be almost instantaneous; distinguished from bulletin boards, email, wikis, and blogs, etc., which are tools for asynchronous communication.

Tagging. A process by which tags or keywords are attached to pieces of information. These tags can then be used for classifying the information flexibly.

Templates. A set of default properties assigned to a set of functionally or conceptually similar pages, for example, on a wiki.

Trackback. Technology used to notify bloggers when their postings are cited or linked to from other sites.

Upload. To send a file to a remote location on the Internet.

Videologs or vlogs. A kind of blog where the entries are short videos.

Web-accessible. A page, a piece of software, or some other information that is placed on the Web and can be accessed by anyone who is online.

Wiki farm. An installation of wiki software that serves multiple separate wikis.

Wiki. A website that can be edited freely and easily by anyone with an Internet connection or by the members of a specific group. The software used to run a wiki is called a wiki engine, and is usually hosted on an Internet or intranet server. Derived from the Hawaiian word for *quick*.

Wikilogs. An example of bliki software, a wikilog is a blog with posts that can be easily edited by users.

Wikiwords. Words, usually written in CamelCase, that become hyperlinks within a wiki.

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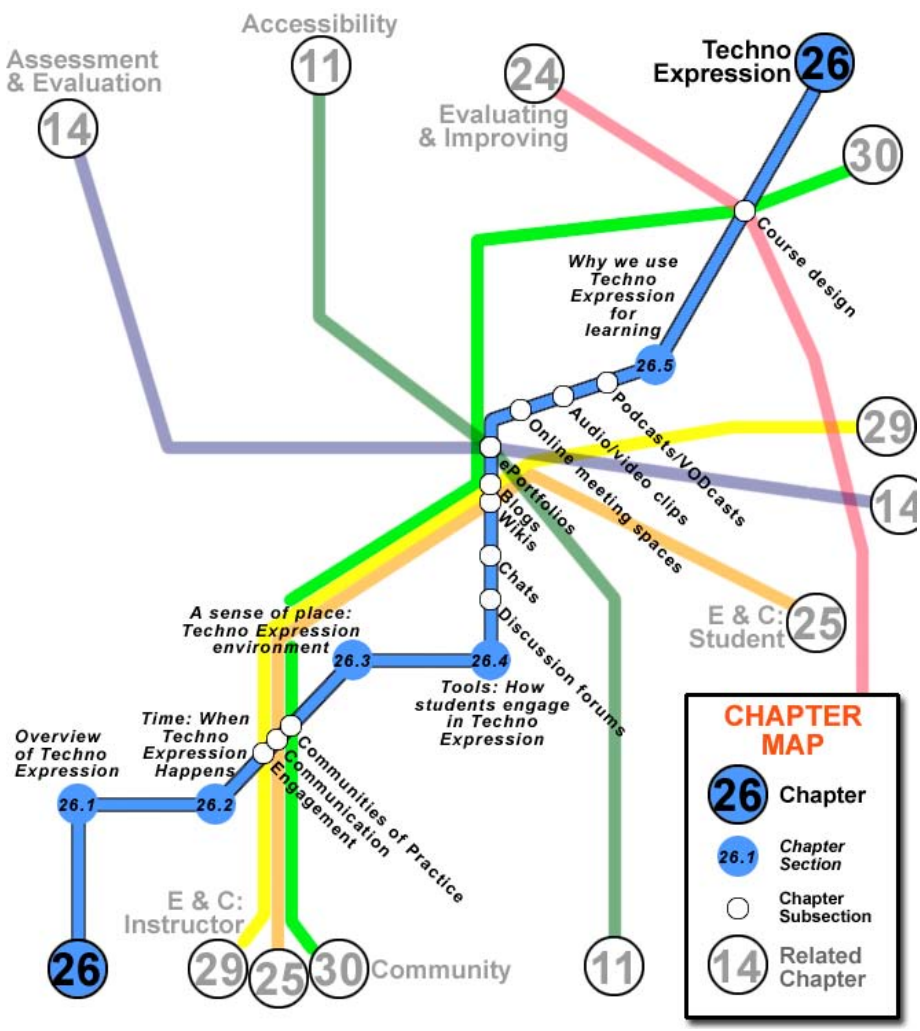
26
Techno Expression

Kevin Kelly and Ruth Cox

… everybody who is human has something to express. Try not expressing yourself for twenty-four hours and see what happens. You will nearly burst. You will want to write a long letter or draw a picture or sing, or make a dress or a garden. – Ueland (1987)



Learning outcomes

After completing this chapter, you should be able to:

- Define techno expression.
- Identify aspects of a learning situation that would provide opportunities for techno expression.
- Determine whether to use synchronous or asynchronous methods for techno expression.
- Create a safe online environment for techno expression.
- Choose appropriate and equitable tools for techno expression.
- Set reasonable expectations for techno expression.

Introduction

> "In the life of the human spirit, words are action, much more so than many of us may realize who live in countries where freedom of expression is taken for granted. The leaders of totalitarian nations understand this very well. The proof is that words are precisely the action for which dissidents in those countries are being persecuted". – Carter (1977)

This chapter lays a foundation for online teachers to recognize K–12 and post-secondary students' needs to express their ideas and viewpoints, both within and outside the context of their coursework. There is a human at the other end of each web page, discussion thread, chat entry, blog, or wiki contribution. We outline specific strategies to create a safe environment for techno expression and offer specific examples of how educators can model and encourage this expression through various technological means. We also describe various tools that instructors can use to facilitate the process. This chapter complements the chapters related to instructor and student engagement by looking at course design, effective online practices, and technological tools that give students opportunities to express themselves.

Until recently "techno" referred mostly to electronic dance music. Related forms of expression ranged from inventing dance moves to expression within creating the music itself. We have seen the term "techno expression" take on a different connotation in places such as the "2006 Techno Expression Series" by the New Jersey Institute of Technology. The first seminar in this series, called "Podcasts, Wikis and Blogs … Oh My!," was designed to inform communications professionals about new technologies. For the online teaching and learning arena, however, this seminar covered only part of the bigger picture. We define "techno expression" as "a technology-based process by which one or more people, either individually or collaboratively, use words and/or media to articulate ideas or thoughts." In this chapter, we will look at a number of variables—notably time (when), a sense of "place" (where), types of media and technology (how), and course design (why)—that affect techno expression in instructional settings and activities.

The human element in technology environments: an overview of techno expression

> "What is passion? It is surely the becoming of a person. Are we not, for most of our lives, marking time? Most of our being is at rest, unlived. In passion, the body and the spirit seek expression outside of self". – Boorman (1992)

Now more than ever, online learning environments provide opportunities for interaction and collaboration. The sonic boom of social networking echoes around the world, as more and more people enter MySpace, Facebook, ELGG, and other social networking sites. What does this tell us? For one thing, it tells us that people want technological ways to communicate their ideas and opinions to a small community of friends, to the entire world, or to any sized group in between. Despite the medium (or media), people are seeking human interaction. The bigger questions for educators are:

- How do we tap into students' energy around social networking and channel it into meaningful, networked learning?
- How do we create a culture of expression that encourages students to consider what they say, how they say it, and who might see or hear it?
- How do we extend learning opportunities to include access to 'outside and offsite' expertise?

Students of all ages log into online environments to explore different forms of self-expression. Younger students want to differentiate themselves from their parents, to create and/or recreate an identity, and to interact with a larger world that they have only just discovered. Older students want to share their experiences with others, to connect with others who share similar views, and to make their mark on the world. As instructors, our job is to create safe and engaging spaces for all of this to happen and to facilitate activities in a way that advances learning success for everyone.

> "When I taught pre-school and K–1 students, I found that half of the learning took place in the classroom and the other half outside it. Outside the classroom environment, my task was to help the children with social interaction skills, such as appropriate ways to express themselves, to communicate, or to act. Interestingly enough, when I began teaching graduate students, I found that not much had changed. The goal of working together peacefully in the sandbox had become the goal of working together peacefully in small groups or project teams. I was still required to help the graduate students with developing strategies for human interaction.
>
> "Frankly, I am still not sure which group is more difficult to manage! In the online environment, I ultimately found that I had to set the stage—not only for students to succeed in reaching the learning objectives, but also for them to succeed in expressing their views in a public forum."
> – Kevin Kelly

Bridging offline, real-life experiences with virtual communication can offer students of all ages access to a world of web-based resources, experts, international exchanges, and virtual fieldtrips. Cyberspace provides access to collaborations that would have been impossible in earlier eras. "Education is no longer the exclusive responsibility of teachers; it benefits from the participation and collaboration of parents, business people, scientists, seniors, and students across age groups" (Kozma & Shank, 1998, p. 5).

For example, in 1996, fourth- and fifth-grade students in Chula Vista, California, studied insects by collecting specimens, obtaining information from websites on entomology, and creating multimedia reports. A special school-university partnership provided these students with even more powerful learning experiences. Students sent their insects to nearby San Diego State University, which was connected to their school via fibre optic cable. Through two-way audio and video, scientists guided the students in examining their insect specimens under an electron microscope. The students were visibly excited as they prepared for each online session with the scientists. While many fourth graders may never have heard of an "electron microscope," these 10- and 11-year-olds were actually using one (Chen, 2001).

In an example from higher education, health experts join students in an online class weekly. Students are required to post a minimum of three times weekly, sharing their own ideas and responding to classmates on challenging topics such as relationships, addiction, and death awareness. For more introverted students, or those self-conscious about public speaking, the safety of online discourse is palpable. Students are excited and affirmed by direct access to experts working in the field. For the guest experts, logging into the asynchronous discussion forum several times during the week and responding to individual student's posts provided a very different experience than giving a lecture in real time. One expert reported that the online discourse provided the seed ideas for a new book. Bringing what happens "offline" in life into the online learning environment can enrich and deepen learning, creating a seamless exchange of ideas and experiences.

Time: when techno expression happens

> "By Modernism I mean the positive rejection of the past and the blind belief in the process of change, in novelty for its own sake, in the idea that progress through time equates with cultural progress; in the cult of individuality, originality and self-expression". – Cruikshank (1989)

The temporal, or time-based, nature of each online activity contributes to how students express themselves. Lisa Kimball, a founder of one of the earliest online communities, the Meta Network (1983), spoke about the importance of *time* in creating a successful experience: "We've been working with time in different ways to create a pulse in the asynchronous time of cyberspace. For an online facilitator, the *walls of the room are made of time*" (Chautauqua Conference on Meta Network, Item 40, 1997). Time is a crucial element in building and sustaining rapport or deepening reflection in the learning process online.

If the activities are asynchronous (that is, not happening simultaneously), then students can synthesize information and form thoughts before engaging in the process. If the activities are synchronous, then students can connect with fellow students for discussions or concept generation sessions. Consider the following pros, cons, and use cases for the two activity timing types to help you determine what to do with your students. (Also see Chapters 25, 29, and 30 for more information related to engagement and communication, as well as communities of practice). Overall, combining asynchronous and synchronous elements throughout a course seems to be the best approach. Students can create a community in different ways and at different times, while having equal opportunities to brainstorm and delve deeply into the material.

Example: Lessons from Wild Geese
At the start of a class, we often turn to metaphors from nature for creating community.

We pose the question, "What can we learn from the behaviour of wild geese as we form our learning community?"

Students post or respond with suggestions such as:

- "They stay in formation."
- "As each bird flaps its wings, it creates an updraft for the bird following. By flying in a V formation, the whole flock adds greater flying range than one bird alone."

And we guide the conversation towards "How might we draw on each other's strengths?"

"When a goose gets tired, it rotates back and lets another take front position—geese instinctively share the leadership role and do not resent the leader."

We ask students to apply the metaphor to the online environment: "How might we do this online, with shared leadership, and community roles?"

"Geese honk from behind to encourage each other to keep going."

"When we notice that someone has not posted, how might we reach out to encourage them?"

ASYNCHRONOUS METHODS OF EXPRESSION

Asynchronous activities allow students to enter more deeply into the material or an idea. There is time to look up facts, to draft an outline of what to say, and to revise mistakes before others respond. For students who speak English as a second, third, or fourth language, asynchronous activities give them time to translate instructions or other students' ideas and to refer to other resources before they communicate their own thoughts. Provided that they have done some preparation, students can be more confident in their work. This aspect of student expression should not be underrated.

On the flip side, some people feel that going through a course with only asynchronous forms of communication can cause students, and even instructors, to feel disconnected. While I have participated in some amazing discussion forum sessions in which students have demonstrated genuine care for their peers, I recognize that we were in a hybrid class that got to meet in person half of the time. Students may drop out of a fully online class, even if it is past the drop deadline, if they do not feel a connection to the instructor or at least to some of the other students. At the beginning of an online course we've found it useful to ask students to talk about what fosters their learning. We share a script of online discourse from a previous semester and cast roles. After the script is read, we ask students to describe what they heard. They often respond by describing the voices as "respectful, collaborative, and caring", or "thoughtful and insightful—I could really hear that people took time to respond". How opinions are shared can be crucial to sustaining a safe environment that all will participate in. Hearing what a democratic dialogue sounds like can help to set a valuable tone and move a group from being a group of learners towards becoming a learning community.

Creating asynchronous assignments that will motivate students to express their opinions is not difficult. For example, a peer-reviewed, written assignment about the US war in Iraq and its impact on international business will generate some impassioned responses. A discussion forum debate about stem-cell research will enliven a biology unit about cell division. If you want to use debate as a way to encourage student expression about topics in your field, the International Debate Education Association (IDEA) has a database of debate topics, called the Debatabase, and a database of debate exercises for instructors to use (http://www.idebate.org/teaching/exercises.php).

Even in math- or science-related fields, students can express opinions. For example, you might create a wiki for the entire class or small groups to solve problems together over time. The first part of the assignment could be for each student to state the best way to solve the problem, to provide a rationale, and to vote on the one the group will use. For problems with more than one solution pathway, this could generate some interesting dialogue. Be sure to read all the winning solution pathways so you can steer groups in the right direction if no one got it right, or if the group chose the wrong pathway.

SYNCHRONOUS METHODS OF EXPRESSION

Synchronous activities can provide a sense of community. For fully online courses, chat sessions or meetings may be the only time that students are in the same place at the same time. Encourage students to use synchronous tools to interact among themselves for small group projects or to help each other with questions or concerns.

Conversely, not everyone can express him or herself quickly in a real-time situation using speech, much less by typing. If you are using a video chat or online meeting space, then students who speak English as a foreign language will be at a disadvantage. Other students may be left out due to lack of access to the additional technologies needed. Synchronous chat sessions can be shallow in content and hard to follow. Words sometimes fly by your eyes faster than you can read, or several threads of conversation can become confusing when students interject new ideas or questions before the first idea or question can be addressed. Your job will be to manage the flow of the conversation. You can do this by setting protocols before you start (see Tip below).

Tip

You can create a virtual "talking stick" by telling students to type a special character or phrase as a way to "raise their hands" during a chat, such as an asterisk (*) or the words "hand up":

Instructor: From the readings, what are examples of music playing a role in freedom movements around the world throughout time?
Student C: *
Student B: Hand up
Instructor: Go ahead, Student C. Student B, I will call you next.
Student C: Chimurenga music in Zimbabwe's liberation struggle
Instructor: Good. Student B?
Student B: US slave songs were sometimes used for communication about escape
Instructor: Right. So, is there a relationship between these examples and today's hip hop?

Example

We conducted a synchronous chat exercise to give students a chance to solicit feedback about their final project ideas from their peers. For this 90-minute exercise, we assigned eight students to a group. Each student was given five minutes to state his or her final project ideas, answering common, predetermined questions. Then he or she was required to stay quiet while the other seven students typed ideas, comments, and other feedback. We had made a rule that constructive criticism meant the peers were obligated to help construct solutions for any problems that they identified throughout the process. There were no problems with student behaviour. Everyone provided supportive and helpful feedback. A survey conducted later determined that the students felt it was a very useful activity for the success of their project. As we archived the chat sessions, it did not matter that the student feedback was almost impossible to read as it was being typed by seven people simultaneously. Each student would have a section of the archive that he or she could review later to determine what changes to make if he or she could not keep up with all of the comments or ideas.

If you are able to have a face-to-face session with students, you can demonstrate the potential for cacophony in synchronous meetings by asking everyone to talk at the same time. Students quickly see the need to take turns in chat or group environments. As we stated when describing strategies for success with asynchronous tools like discussion forums, read a script that models the type of chat you want to conduct. Let students know that it is important to you that they state their opinions openly without fear of attack from the instructor or other students.

A sense of place: the techno expression environment

"I desire to speak somewhere without bounds; like a man in a waking moment, to men in their waking moments; for I am convinced that I cannot exaggerate enough even to lay the foundation of a true expression". – Thoreau (1906)

THE PROS AND CONS OF A TECHNOLOGY-MEDIATED ENVIRONMENT

The type, or types, of media that you require students to use to express themselves can change the results that you get from students. We co-teach a hybrid class about distance education, where five of the ten class meetings are conducted online. The first classroom meeting is face-to-face. At this meeting, we ask students to use pastel pencils and construction paper to draw a symbolic representation of how they see the educational process. At the same meeting we use a focused listing activity, first asking students to list five to seven characteristics of the best course they ever took, and then to compare those lists with a neighbour to find similarities. We go through these two exercises back-to-back. It is always interesting to see how they yield some similar results, confirming what the students think, and some different results, perhaps due to the fact that the students are using a different part of their brains. The same is true for you. Provided that your students have equal access and ability to use various media applications, you can ask your students to use different methods to express their ideas.

Constant advances in technology give students more options for communication and collaboration than they had even two or three years ago. For the symbolic representation and focused listing activities described above, we ask the face-to-face students to use art supplies, pen, and paper. We would use several technologies to do the same exercises online: an art program, like KidPix or Photoshop, a word-processing program or an online reflection space, and an environment to display the results, like Angel or Moodle. Web 2.0 brings new possibilities for expression within educational contexts. According to Wikipedia, the term Web 2.0 "refers to a second generation of services available on the World Wide Web that lets people collaborate and share information online (para. 1)". Weblogger Richard McManus defines "Web 2.0" as "The Web as Platform". No matter how you slice it, technology has changed to make it possible for the everyman to interact with the entire globe, using just a computer with an Internet connection and browser.

While this newfound power has many people excited, there are some who see a downside. "Basically, ideological lines run thusly: Web 2.0 either empowers the individual and provides an outlet for the 'voice of the voiceless'; or it elevates the amateur to the detriment of professionalism, expertise and clarity" (Wikipedia, n.d., para. 17). It is ironic that the Wikipedia entry for Web 2.0 contains this discussion, since many educators require secondary sources when students use information from Wikipedia to support arguments. For example, "Alan Liu, a professor of English at the University of California at Santa Barbara, adopted a policy that Wikipedia 'is not appropriate as the primary or sole reference for anything that is central to an argument, complex, or controversial' " (Jaschik, 2007, para. 8). Dr. Liu is not alone in his hesitation to trust a community-built resource as a primary reference for an argument. Since anyone can edit Wikipedia, anyone could add false or unverified information that students might accept as the truth.

In the world of education, we do not always have to be so esoteric. Yes, we need to make sure that research data is valid, reliable, and unbiased. In fact, I tell my students that they should question every source: published or unpublished, print or digital, peer-reviewed or not. However, when asking our students to participate in learning activities, our goal is to level the playing field so that everyone can participate equally. With Web 2.0 technologies, such as weblogs, wikis, and really simple syndication (RSS), students can share reflections to which others can reply, collaborate on projects over distance, and publish media broadcasts (e.g., podcasts) to which other people may subscribe. We will get into the tools used for techno expression right after a section on setting boundaries. In other words, define the rules before you provide the tools.

CREATE A SAFE PLACE FOR TECHNO EXPRESSION BY SETTING AND ENFORCING BOUNDARIES

Before the class begins, define any conventions that you, your department, or college, and even your school or university have related to student behaviour in the online environment. Use your syllabus to document these conventions. Start by stating your own expectations and having students brainstorm norms that they'd like. You can augment those rules with those of your department or college, such as link to a student code of conduct, or those of your campus, such as a link to an acceptable use policy (AUP). University first-year experience (FYE) courses and new student orientations are a good place to start this type of conversation from the institutional perspective.

Some instructors just refer to one of the many Netiquette (Internet etiquette), definitions on the Web. Common Netiquette rules include "Think before you post," "Remember the human," and "Remember: your future employer may be reading." Even if students are not motivated by the other rules, this last rule may be more true than students think. An article in the *Washington Times* (Palank, 2006) discusses the perils of students expressing themselves too freely on social networking sites and other publicly accessible areas online. Using your syllabus to tell students your expectations about their behaviour is the first step to successful expression.

Example

Here is a syllabus section about student responsibilities in the online environment that includes a sentence about Netiquette.

Student Responsibilities in Online Environment (Moodle)

We will be using Moodle as the primary method to communicate class-related messages. You are responsible for making sure that the correct email address is attached to your Moodle username, both at the beginning of the term and if you change your email address. We will use the "Core Rules of Netiquette" as guidelines for online interaction (see http://www.albion.com/netiquette/corerules.html).

Starting with a common framework like Netiquette does not mean that students cannot express themselves freely. Techno expression and students' rights go hand in hand. While you do not need to concern yourself with student expression on private websites or personal space on social networking sites, we are starting to see these spaces intersect with education and even the courts. In "Education tips from Indiana University" (http://newsinfo.iu.edu/tips/page/normal/2316.html), the campus media relations office raises issues related to student expression and the law, citing a student who "bashes her teacher on a private blog" as an example of something that might initiate disciplinary action at a school. The First Amendment Center posted an article about student expression in K–12 public schools (http://www.firstamendmentcenter.org/speech/studentexpression/overview.aspx), but many of these ideas definitely translate to the higher education environment as well. Overall, you do not need to go overboard. If you let students know the boundaries, then they will usually respect them.

When the time comes to facilitate student interactions, the key is to maintain a safe environment for everyone to share. Keep in mind that students may not know that they have done or said something offensive. In one example, a student may post a message in All Caps—using only capital letters—to encourage someone. Internet protocol, however, equates All Caps to shouting, which many consider rude. In another example, a student may take advantage of a listserv used by a large class by sending an inappropriate email, such as an advertisement for a friend's concert or a relative's business. A good rule of thumb is to contact the student by email to let them know what words or practice they should change in the future. Remind them to look at the syllabus and include a statement about what will happen if they do it again. Make sure that the students know your ultimate goal is to create a safe environment for them to express themselves.

Tools: how students engage in techno expression

> "Technology is not an image of the world but a way of operating on reality. The nihilism of technology lies not only in the fact that it is the most perfect expression of the will to power … but also in the fact that it lacks meaning". – Paz (1967)

We have spent a good deal of time talking about expression, but not as much about technology. For this topic to work, it needs both. There are a number of technologies—asynchronous and synchronous, print-based and media-based, old and new—that comprise a wide variety of choices to engage students. The rapid change in technology will not slow down, so we have to adopt strategies that are based in the learning objectives, rather than the technology itself. That way, we can adjust the technology required to complete assignments, but the students are still required to demonstrate the same types of knowledge, skills, and attitudes.

Maureen O'Rourke from the Australian National Schools Network wrote an article about taking a "Multiliteracies Approach" to engage students. In the article, O'Rourke (2002, para. 2) describes three levels of student engagement: technical, practical, and critical. To help students reach the highest level, critical engagement, she recommends that we "provide them with opportunities to both express themselves and make sense of the world through multiple modes of communication" (O'Rourke, 2002, para. 3). There are quite a few tools at our disposal to help our students become multiliterate.

THREADED DISCUSSION FORUMS

Threaded discussion forums provide some of the best opportunities for techno expression. Forums allow students and instructors to continue classroom discussions when time runs out, to start conversations about class readings or assignments, to review course material before tests or evaluations, and more. Being asynchronous, students can reflect before they submit their ideas, comments, or feedback. This levels the playing field for students who speak English as a second language and students who are not savvy with technology. Students can take their time to construct an argument, review their ideas, and even run spell-check before they actually post it in the forum.

Tip

To encourage students to share different points of view, ask them to discuss the significance of the course material in relation to current events or to their personal lives. This works for almost every discipline. Give students specific expectations, such as what they should accomplish with their threads (e.g., explain a concept in their own words, react to a statement, contradict an expert, etc.), how long their discussion thread should be (e.g., number of paragraphs or words), whether or not they should refer to the readings, how many replies they should submit, and when it is due.

CHATS

In some ways, chats can resemble a classroom setting in both good and bad ways. In the "good" column, chats are live, synchronous activities that gives participants a sense of being in the same place, even if they are all sitting at home with a cup of coffee and a cat in their laps.

In the "bad" column, only a small percentage of students get a chance to express their views in the classroom. The same is true for chat sessions. Factors that contribute to this in chats include, but are not limited to, social dynamics involving students who dominate conversations, cultural tendencies not to speak up in public, reluctance to contribute due to language difficulties, poor typing skills, or shyness. As an instructor, it becomes your job to facilitate discussions that give everyone a chance to add their ideas to the conversation. (Review the tip and example in the section on synchronous methods of expression above, for facilitation and assignment ideas to try.)

WEB PAGES AND GRAPHICS

Static web pages provide a space for faculty and students alike to state their views on academic and non-academic topics. Some learning management systems (LMS) provide space for students to create web pages. Many schools and universities now provide web space in conjunction with email account. If appropriate, ask students to create web pages related to your course material.

Consider asking students to engage in creative expression with applications like Adobe Photoshop or other graphic creation and editing tools. For example, students can create a digital collage to show how they feel about a topic. In the past this type of assignment was done with magazines, scissors, and glue. Now students can do it with magazines and scanners, web image search engines, Photoshop, and colour printers. Even if you ask students to draw something with paper and pencil, they can scan it and post it to get feedback from other students.

Example

At the Manhattan Center for Science and Mathematics, the Advanced Multimedia class requires students to create a self portrait using Frida Kahlo's paintings as an inspiration (http://www.mcsm.net/art/frida.html).

Before assigning students to create web pages and digital images, you should check to make sure that they have access to the hardware and software required to make them. There are several free web page editing software applications, such as SeaMonkey Composer by Mozilla.

WIKIS AND BLOGS

Wikis, or collectively built web pages, provide students an opportunity to collaborate on group or class projects. Since anyone can edit the wiki pages, it is a good idea to set some ground rules, similar in nature to the concept of Netiquette described above. Some common wiki rules include not deleting anyone else's contributions without permission, avoiding slang and acronyms, and contributing only original material.

Example of techno expression assignment using wikis

Wiki assignments that encourage expression might be similar to those described above for static web pages, or they might be more complex.

Wiki assignment example for a seminar in intellectual freedom at Indiana University: In the assignment, students are asked to do two things:

- Make a wiki entry on a controversial intellectual freedom issue

  "For the first part, you will collaborate with another person and write a wiki entry on a controversial intellectual freedom issue that is discussed either in class or in the readings … This entry should have three main sections. In the first section, clearly introduce and define the issue that you are exploring and explain its significance. In the second section, develop the main argument of the entry. Explain both sides of the issue (you explain one side and your partner explains the other). Try to offer the strongest case for your side of the issue. Make use of other resources in your entry, including articles and websites, where appropriate. In the third section, take an informed position on the issue. This means giving your opinion and supporting it in some way. You will express your opinion as will your partner. You and your partner can agree, in which case you can write this section together, or you can disagree, in which case each writes his or her own third section" (Rosenbaum, 2006, para. 72–73).

- Contribute to at least two other wiki entries

  "For the second part of the assignment, you will contribute to at least two other entries in the wiki. This will involve posting your informed opinions, clarifications, additions or suggestions for deletions to other entries. In your posting, be sure to make reference to relevant materials whether from the course or your other reading" (Rosenbaum, 2006, para. 75).

Students can and will go beyond the assignment parameters. For example, look at the results of a wiki project assigned by co-professors Michael Jones and Gail Benick. In the winter of 2006, they taught a second-year survey course in communication, culture and information technology through a joint Sheridan/University of Toronto–Mississauga degree program. Jones and Benick (2006) reported that:

> "the approximately 140 students of CCIT 205 created 598 pages through nearly 9,000 edits. In comparison, as noted on the Wikispace main page, the top public Wikispaces average about 1,000 edits a month. The level of activity was simply mind-boggling.
>
> "More important than these numbers, however, was the strong student evaluation of their Wikispace experience. Students took it upon themselves to create an assignment feedback page separate from course requirements to share their experiences. Even without being formally required to share their experiences, 54 students did—and with a few lukewarm exceptions, evaluations were positive, sometimes extraordinarily so" (para. 11–12).

Interestingly enough, this was an experiment for these instructors! They entered the world of wikis with little idea of what to expect, and the students responded by creating a community. One of the many student comments pulled out the theme of this chapter:

> "As we progress further and further into an 'interconnected' environment, from WebCT, initially, to Wiki spaces, there becomes more room for communication, expression and collaboration. I find it interesting how technology that may appear superfluous, superficially, can actually bring people together to share, learn and grow. The possibilities of these types of applications in educational institutions are endless!—S" (2006, para. 10).

Weblogs, also called blogs, give students a space to reflect about any number of topics. For example, an instructional design professor at San Francisco State University assigns her students to use weblogs to reflect on the readings and to relate course material to their jobs, if possible. Most blog tools allow students to sign in and start writing.

Examples of techno expression assignments using weblogs (blogs)

A weblog would be perfect for a set of activities like those described in the Shorecrest Preparatory School's Upper Division Catalog:

> "Humanities: This segment of the Ninth Grade Wheel is an introductory course which uses a variety of media and activities to promote critical thinking and discussion about several forms of creative expression across time and cultures including visual art, architecture, theater, music, and dance. During the nine week course, students will begin to formulate and express their ideas about the arts beyond "I like …," or "I don't like …," using the philosophies and the vocabularies relevant to these disciplines as introduced in class" (2005, para. 25).

Blog assignment example from an Introduction to Multimedia course at American University:

> "300 word summary of why the study of cybernetics is important to society, specifically, the way in which humans interact with machines, and how that might affect the quality of life" (Packer, 2004, para. 17).

Blog assignment example from a course called "e-rhetoric: writing persuasively in a digital world" at Stanford University:

> "As part of our experimentation with e-rhetoric, students will create and post to a class weblog. Each student will complete at least 5 individual posts and contribute at least 2 comments to their classmates' blogs. Keeping the blog will enable the student to track his/her development as a writer and researcher, as well as to gain hands-on experience with one distinct and very popular form of e-rhetoric" (Alfano, 2005, para. 1).

Advice on using blogs to teach philosophy from Academic Commons:

> "Philosophical creativity involves raising the most thought-provoking questions and defending one's own answers to such questions. Blogging encourages creativity in philosophical debate, especially when each student has his or her own blog, because it allows for fairly spontaneous expression of ideas and it invites students to journey out of their

> blogs into the blogworld established by another" (Patrick, 2005, para. 6).

If the students use online weblog sites that are not controlled by the school or university, then you will have to decide to what extent you will watch what they post. While students should have full freedom of expression, they may need coaching about what is appropriate or inappropriate material. It is in the students' best interest to listen, as prospective employers may be looking at these sites as well.

ELECTRONIC PORTFOLIOS

Instructors can use electronic portfolios to let students demonstrate knowledge and skills, using a collection of assets (e.g., essays, multiple choice exams, reflections, video clips of performance, observation logs submitted by experts, etc.). Following the concepts of universal design for learning (see Chapters 10 and 11), students should be able to choose different assignments to portray their abilities. For instance, a student might pick a history paper to represent his or her writing skills instead of a paper from an English class.

ONLINE MEETING SPACES

Regardless of the online meeting space tool (WebEx, Elluminate, Breeze, Horizon Wimba, etc.), students can express themselves in a number of ways. Many of these environments have options for real-time chat, polling, and voice channels (or a conference call option in conjunction with the online meeting). With these tools, you can allow students to make presentations to the rest of the class by virtually handing them the microphone.

Massively multiplayer online role-playing games (MMORPGs) provide an unorthodox, but highly effective, type of online meeting space. Todd Bryant (2006) outlines this concept in his article "Using World of Warcraft and Other MMORPGs to Foster a Targeted, Social, and Cooperative Approach Toward Language Learning." He uses a fun environment that allows him to facilitate language learning activities. MMORPGs combine the social networking aspects of MySpace or FaceBook with the entertainment value of video games. In their books, *What Video Games Have to Teach Us About Learning and Literacy* and *Don't Bother Me Mom—I'm Learning!*, James Paul Gee and Mark Prensky look at the educational benefits of learning by doing and forcing students to make decisions in a low-stakes environment. If instructors can find ways to use them for education, MMORPGs offer positive motivation for learning in that they are fun for all ages, genders, and backgrounds. For example, more people over 18 play World of Warcraft than people 18 and under. Instructors can capitalize on the students' interest in MMORPGs by creating their own learning situations in Second Life and other virtual environments.

WEB-BASED AUDIO AND VIDEO CLIPS

Although the end product is an audio or video clip, you can still make strong writing the backbone of these assignments. Examples include digital storytelling, video clips of student presentations or student teaching, and audio clips demonstrating language proficiency. Hall Davidson (2004) describes a scaffolded process in which students do not always need a digital video camera to produce videos that demonstrate understanding of the course material. The Apple Learning Interchange (http://edcommunity.apple.com/ali/index.php) contains examples of teacher and student videos from middle school, high school, and higher education.

PODCASTING AND VODCASTING

Remembering that podcasts and VODcasts are more than just audio and video files, we must think of projects that would require students to produce a series of audio or video files to which people can subscribe via really simple syndication (RSS). If you want to do this as an entire class, individual students can each contribute one audio or video file, then you could make one assignment that requires each student to express his or her opinion about a topic. Each audio or video file will then be posted throughout the term as part of a series. You can also ask groups to contribute several files each over the course of an entire school term.

Examples of Techno Expression Assignments Using Podcasts

Before, we had position papers. Now, we can have position podcasts. Ask your students to take a position about a topic in your class. Then have the students sign up, individually or in groups, for a time slot when they will produce an audio or video file to be broadcast. The collection of audio or video position statements will become a compendium of student opinions for that term.

Example of using student podcasts in literature classes from Academic Commons:

> "Each podcast assignment consisted of a "podcast pair" (two podcasts); students made a 5-minute reading of a passage from a novel, coupled with a 5-minute discussion of that passage: why the student

> chose it, what details were most important, what themes and issues the passage raised, and how the passage related to the rest of the novel. These podcasts were posted on a server and all students in the class were required to listen to selected podcasts on what they were reading before coming to class discussions" (Evans, 2006, para. 4).

Each of the technology tools described above has the potential to let students express themselves. Some of them, such as audio and video, may open doors to creativity for students who have only written essays up to that point. Instructors who use media projects report that students are more engaged, especially if they know that other students or the public will view the final product. It is important to make sure that students will have equal access to, and relatively equal ability with, a technology when creating assignments that rely on it.

Why we use techno expression for learning

> "We must continually remind students in the classroom that expression of different opinions and dissenting ideas affirms the intellectual process. We should forcefully explain that our role is not to teach them to think as we do but rather to teach them, by example, the importance of taking a stance that is rooted in rigorous engagement with the full range of ideas about a topic". – Hooks (1994)

CONSIDERING TECHNO EXPRESSION DURING COURSE DESIGN

Chapters 10, 11, and 13 cover course design in great detail. In this chapter we focus on those aspects of course design that relate to interaction and expression. We will give some examples and strategies for providing students with opportunities for expression in any scenario, face-to-face courses with online supplements, hybrid courses, and fully online courses. We will also discuss our own experiences with, and preferences among, these three scenarios.

When you design your own online course environment, keep interaction in the front of your mind. Many people new to using the online environment start the course design process by planning what materials they want to upload. For example, many instructors state "I just want to upload my syllabus for now." This is a logical place to start. After all, you want the students to know up front what your expectations are, whether they are the course learning objectives, your course policies, or your grading plan. It does not take much more, though, to give students an opportunity to state their own expectations for the course. Create a threaded discussion or wiki assignment, asking students to review the syllabus and then to write one or two things that they would like to get out of the course, how the material could be made more meaningful to them or for their goals, and even their preliminary opinions about some of the main course themes or topics.

Even if you are not completely familiar with the online environment, you can go beyond just uploading a syllabus by including course materials, such as readings, presentations and lecture notes. Again, it will not require a huge effort to create one general threaded discussion to let students tell you about the applicability of the materials to their lives or studies or to express their opinions about different aspects of the content itself. If you want to make a discussion forum to gauge the effectiveness of the course materials, then Chapter 24, Evaluating and Improving Your Online Teaching Effectiveness, has many more ideas about getting student feedback and soliciting constructive recommendations.

In addition to giving students an opportunity online to discuss the course overall and its different components, we recommend giving students an opportunity to talk about themselves. Many face-to-face instructors devote some portion of the first class meeting to an icebreaker activity or student introductions. You can do the same thing online. Create a discussion forum, blog, or wiki assignment for students to state how the class will help them meet academic or professional goals, or what they expect to achieve personally. An online activity like this allows you to return to it throughout the term, assigning student reflections about their own progress towards the previously expressed goals. The assignment can also enable other student techno expressions, such as photos, brief descriptions of where they are from, or even a sense of "in the moment" place (e.g., "From my computer, I can see the pine tree in my yard through the San Francisco fog each morning"). These activities can be limited to individual student-to-teacher communication, or they can be public, so other students can provide encouragement, feedback, related stories or resources, and more.

In a field study investigating the experiences of adults engaged in a year-long, computer-mediated MA program in psychology, participants took online courses, explored aspects of their psychological and spiritual development and shared their life stories through creative writing and imagery online. The primary means of communication was within an asynchronous online conference (Caucus). Through an ethnographic participant-observation approach, supported by online transcripts, field notes, a focus group discussion, questionnaires, and phone interviews, some key themes about techno expression emerged. First, personal storytelling and virtual group discourse revealed that the participant's sense of self-identity extended beyond the individual or personal to encompass wider aspects of relatedness to others or to the natural world. Participants reported the importance of pace and flow in online discourse as well as a sense of immersive presence. Sustained online discourse was found to be the most crucial component in creating a supportive structure for collaborative learning.

Seven key elements were cited by students as being transformative:

- combining several face-to-face meetings with virtual presence;
- community size, structure, tone, and intention;
- being a part of a self-creating, self-maintaining, and self-defining class, through flexible curriculum design and whole-group learning;
- encouragement by instructors of in-the-moment self awareness, mindfulness, and immersive presence;
- guided risk-taking through shared feelings and life experiences;
- humour, improvisation, and creative expression; and
- a shared search for meaning: Seeing all of life and education as a transformational journey (Cox, 1999).

If you have a choice, we recommend designing a hybrid course over a fully online course. Even if it means having only two face-to-face sessions—one to launch the course by setting course norms and expectations and by reading a script of online discourse to set tone, and one to close the class—this will improve students' abilities to express themselves freely to peers.

Similarly, it is important to mix it up, with respect to the work that you assign. Apply the good lessons that we have learned from those who have explored online community building (see more about building communities in Chapter 30, Supporting E-learning through Communities of Practice), such as those that tell us to assign community roles, assign rotating facilitation, and incorporate assignments that ask students to engage in experiences offline and then to report back to the instructor or the class.

CONSTRUCT ASSIGNMENTS THAT ENCOURAGE EXPRESSION

You may already have dozens of ideas, or you may have some difficulty thinking of assignments that require students to express their points of view. Below are some questions that you can use to get started during the course design process.

To whom will students express themselves?

There are a number of potential audiences to whom students could express themselves: to the instructor, to an expert in the field, to a small group of peers, to the entire class, to prospective employers, and to the public. No matter what size the audience or who is in it, students should be prepared to make their case, to state their opinions, and to answer follow-up questions. This means that over the course of a term, you should mix up the audiences for various assignments to give students practice in expressing themselves differently. For instance, a marketing student creating a video advertisement presentation will most likely behave differently for a group of peers than for an advertising professional. A special education credential student writing a reflective weblog entry about a classroom observation only for the supervising faculty member might use different language than for the public at large. These types of experiences will prepare the students not only for future coursework but also for job interviews.

How will students express themselves?

The question of how students can express themselves was discussed earlier. During the course design process, your task is to identify the best method for students to achieve the learning objectives. If you want to assign reflection activities, consider using ePortfolio, a blog, or a podcast. These reflections can ask students to describe why they did something a certain way, or they can ask for opinions about a topic. If you want to have students work in groups to perform research, use a wiki and ask students to state their viewpoints in addition to the facts related to the research topic. If you want students to give a presentation, either live or online, then use podcasts or VODcasts, have students post PowerPoint slides with audio, or have them give the presentation using an online meeting space.

Why will students want to express themselves?

Many students will want to express themselves, but not everyone is built the same way. Some students may feel uncomfortable and others may not have much experience making their own thoughts public. Therefore, it will help if you choose meaningful assignments, define the expectations, and provide examples of good work.

Example of techno expression rationale

"Why are we keeping a blog?

Blogging gives us a unique opportunity to think about both the way in which electronic rhetoric transforms written discourse as well as e-rhetoric's innovative relationship to both private and public communication. In addition, keeping a blog allows you to use writing to explore issues related to digital culture, to sharpen your analytical skills, and to participate in a larger community conversation about the impact of technology on our lives" (Alfano, 2005, para. 3).

PROVIDE GUIDELINES FOR STUDENTS

There are a number of ways that you can help students—before, during, and after the assignment. Before, the assignment, write clear instructions, including information about your policies on academic integrity and plagiarism. Provide examples of prior students' work.

If this is the first group to do this type of assignment, go through the assignment yourself to create a model of what you consider to be good work. Let students know what could happen to their work if someone else were able to change it.

Example of techno expression guidelines for wikis

"REMEMBER: The work you submit is recorded and logged. Do not get mad if someone else edits your content for you, that's the entire point of this exercise. Topics should not be 'sat upon' with tags such as 'DO NOT EDIT THIS PAGE'. All topics are open to constructive addition by any member of this space. Also, keep in mind that you can always edit a page back to its previous state by clicking on the history link, clicking on the old page, and hitting the 'revert' link at the top" (Jones and Benick, 2006, para. 17).

Post rubrics or grading criteria ahead of time so students know what is important and how they will be evaluated. Include one or more criteria related to originality or expression (see Figure 26.1).

Evaluation Criteria	3	2	1
Student Expression	Student clearly states how the course material relates to his or her life, including how he or she feels about it	Student states how the course material relates to his or her life, but does not include his or her feelings about it	Student does not show how the course material relates to his or her life

Figure 26.1

During the assignment, watch for "flaming," that is, angry or inflammatory messages (http://www.computeruser.com/resources/dictionary/definition.html?lookup=6608) in forums and chats. Keep an eye on how students are expressing themselves, and provide guidance if it seems appropriate to do so. Be sure to point out positive examples. In wikis, watch for students deleting other students' work without permission. While it is okay for students to edit each other's work, there are protocols for deleting. One student nominates a section for deletion and another person in the group—preferably the author—actually deletes it once there is a rough consensus.

After the assignment, use evaluation criteria such as the one shown in Figure 26.1. Include comments about how you think the students can improve.

ACKNOWLEDGE STUDENT VIEWS

It is not enough to just create an assignment that gives students a chance to give their opinions. For this to be a part of the learning process, we need to acknowledge the students' points of view and provide feedback. If workload is a factor, then try acknowledging just one or two ideas in the face-to-face setting. You can choose these at random, or you can pick the ideas that have generated the most discussion. The point is to let the students know that you are aware of their work and that you value their opinions.

Summary

> "It is the supreme art of the teacher to awaken joy in creative expression and knowledge". – Einstein (n.d.)

In this chapter, we have answered the questions "Who does what to whom, when, where, how, and why?" as they relate to techno expression. The concept of student expression is not new, but the online teaching and learning environment gives both instructors and students amazing possibilities in this area. There really are so many pathways to techno expression, it is staggering. We hope to see your examples on the Internet some day!

There are a number of factors that go into successful techno expression. You can establish asynchronous or synchronous timeframes, depending on your goals. For brainstorming and presentations, synchronous activities work well. For reflection, research, and collaboration, asynchronous activities give students time to generate original ideas.

Since students seldom get a chance to share their thoughts in academic settings, they may be tentative at first, though given the number of student accounts in social networking areas like MySpace and FaceBook, perhaps they will jump right into it. Either way, techno expression works best when students have a safe environment in which to try new things.

There are a number of tools that enable techno expression, and that list will continue to grow. Whatever media type you choose for the students—print, audio, video, multimedia, or multiple forms of interaction in an online environment—be sure to align the end result with the learning objectives. Students will be able to express their views, regardless of the medium.

Finally, allowing students to state their opinions does not automatically add work for the instructor, nor does it necessarily pull students away from the underlying learning objective(s). Instead, techno expression can inspire students to go well beyond expectations, as Michael Jones and Gail Benick learned during their wiki experiment. Students will appreciate any efforts you make to let them speak their minds. They will appreciate even more your acknowledgments, feedback, and responses. When designing a course, techno expression can be a way to add meaning to the assignments for the students. Be sure to make it fun for you, too!

Glossary

Flaming. The practice of sending angry or inflammatory messages online (http://www.computeruser.com/resources/dictionary/definition.html?lookup=6608)

Multi-literate. Being literate in in the sense of being able to understand information in a number of contexts. "… students will draw on a range of knowledge and contexts from many disciplines, as well as on multiple modes of communication" (O'Rourke, 2002, para. 8).

Netiquette. Internet etiquette, usually based on the Golden Rule ("Treat others as you want to be treated").

Really Simple Syndication (RSS). A format for syndicating Web content (http://www.webopedia.com/TERM/R/RSS.html)

Techno expression. A technology-based process by which one or more people, either individually or collaboratively, use words and/or media to articulate ideas or thoughts.

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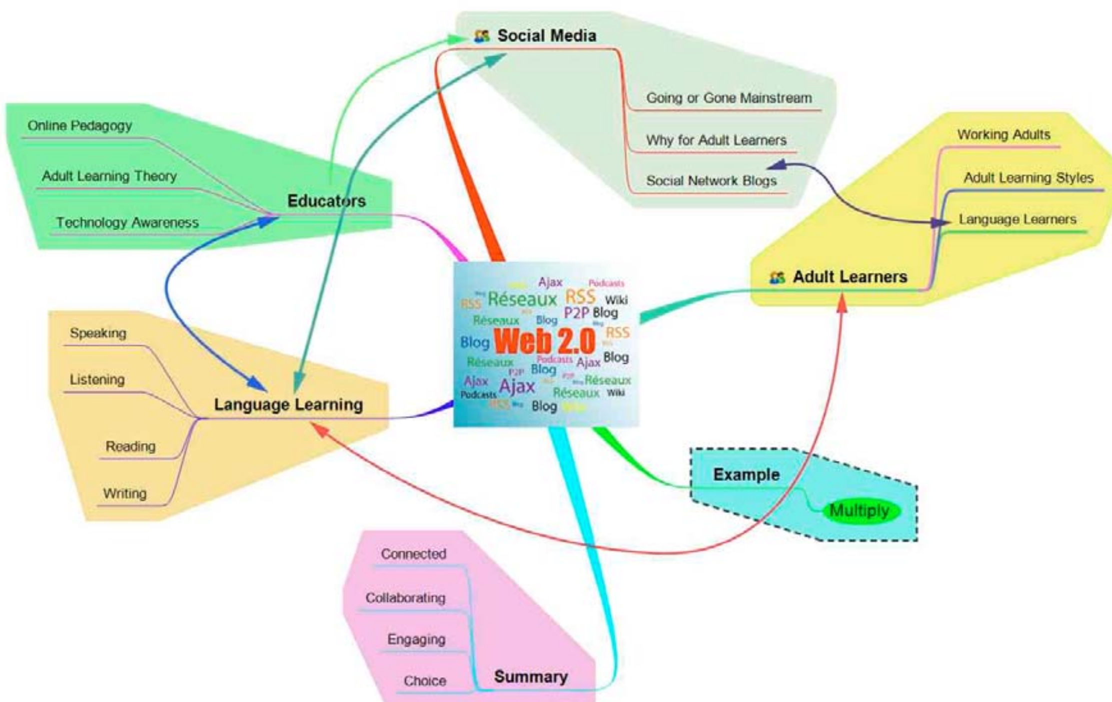
27
Social Media for Adult Online Learners and Educators

Moira Hunter

Computers are incredibly fast, accurate, and stupid; humans are incredibly slow, inaccurate, and brilliant; together they are powerful beyond imagination. – Albert Einstein



Learning outcomes

After completing this chapter, you should be able to:

- Have deeper insight in the social implications of including social media software in e-learning with geographically distributed adult learners.
- Understand and apply principles of adult learning theory in planning for online learning with working adults.
- Identify primary considerations for planning online language learning.
- Select the most appropriate tools to ensure an engaging learning experience.
- Create a simple and safe online environment.

Introduction

> "Email preceded the Internet … blogs are ten years old and wikis have been around since 1995 … If most of this stuff is twenty years old, why are we talking about it now? Because it's not about the tools, it's about the people. The reason that it matters now is that we are experiencing a seismic shift—it's about who can be brought together with these tools". – Ethan Zuckerman

Today, thanks to wide Internet and broadband adoption, educators can develop and distribute materials and resources, often co-created with their learners or developed entirely by the learners. Among the emerging technologies is a new generation of social software called 'Web 2.0', a term first coined by Tim O'Reilly (2005). These emerging technologies, or emerging humanity as Bryant (2007) states, use connectivism to enable social and personal learning (Siemens 2004, 2005) to enhance and promote lifelong learning.

Social media, in contrast to traditional media, uses "the wisdom of the crowds" (Suriowecki, 2005) to collect, create, and share information and it is particularly pertinent to the online adult learner. Social software is often available for free or a low cost, with no or little maintenance. The ease and speed in setting up an online supportive learning environment by independent, institutional, or corporate trainers lends itself to 'just in time' learning for one-to-one and small group learning.

Among the plethora of tools, with new programs appearing everyday, blogs and wikis are going mainstream in educational and corporate learning, often replacing the costly CMS and LMS. The choice of technology depends on the educator's needs for a tool to support any specific learning outcome with the predetermined target audience and their learning needs. Blogs or wikis can replace an LMS in one context but perhaps not in another. The technology must fit the pedagogical needs and not the reverse. Educators need to develop a critical awareness of the tools available, and the skills needed to use them, before choosing a technology or technologies to support learning.

This article will focus on the blog, which to date, has been adopted widely by non-technical educators for its ease of use and maintenance as a publicly accessible web application. The target learners are geographically dispersed working adults, collaborating fully online in small groups to enhance their language skills and competencies.

Going or gone mainstream

> "He that will not apply new remedies must expect new evils; for time is the greatest innovator". – Francis Bacon

Blogs or the concept of blogging has been around for some time, with Sir Tim Berners Lee creating the first website in 1991, Dave Winer blogging in 1996, and John Barger coining the term 'weblog' in 1997. Since its first appearance, the blog or weblog has come a long way, not only being considered today as a creative medium to publish personal thoughts and observations, but as a means to fulfill other purposes for the users. It is now mainstream, used by many to replace Web pages, content management systems, and learning management systems.

Editable web spaces, free or at low cost, with no programming or design issues, are now enabling the educator to integrate technology into the learning experience without relying on the institution or company to decide to purchase, install and monitor systems. Blogs, together with wikis, are tools where student-directed learning can happen with students and educators sharing their learning responsibility. Blogs are relatively easy to use where the author can write the content, personalize the 'look and feel' of the blog and carry out constant updates with minimum hassle and knowledge of web-based applications.

The wiki coding was developed by Ward Cunningham in 1994 and he produced the first wiki in the following year. The word 'wiki' was inspired from "wiki-wiki", the Hawaiian word for quick. A wiki is a website which enables approved users to edit the content and lends itself perfectly to collaborative online learning, especially with geographically dispersed users. Another great advantage of wikis is the ability to revert back to previous versions of pages, as they are never lost but 'stored'. Wikis are therefore ideal for workplace and learning cultures which encourage collaborative work but may not be appropriate for all learning environments. Again, the educator or trainer should assess the learning context and the learners' needs first before choosing a technology or technologies to support the online learning.

The deployment of social media rich features in an online learning event implies not only a paradigm shift between the teacher and learner but also in the consequential control and usage of the features available within these social softwares.

As an educator, are you ready for the learners to take control and become co-teachers? Are you ready to be a co-learner in the learning process?

Why social media for adult learners?

> "Blogging is using a new medium for what it is good for—connecting and interacting". – George Siemens

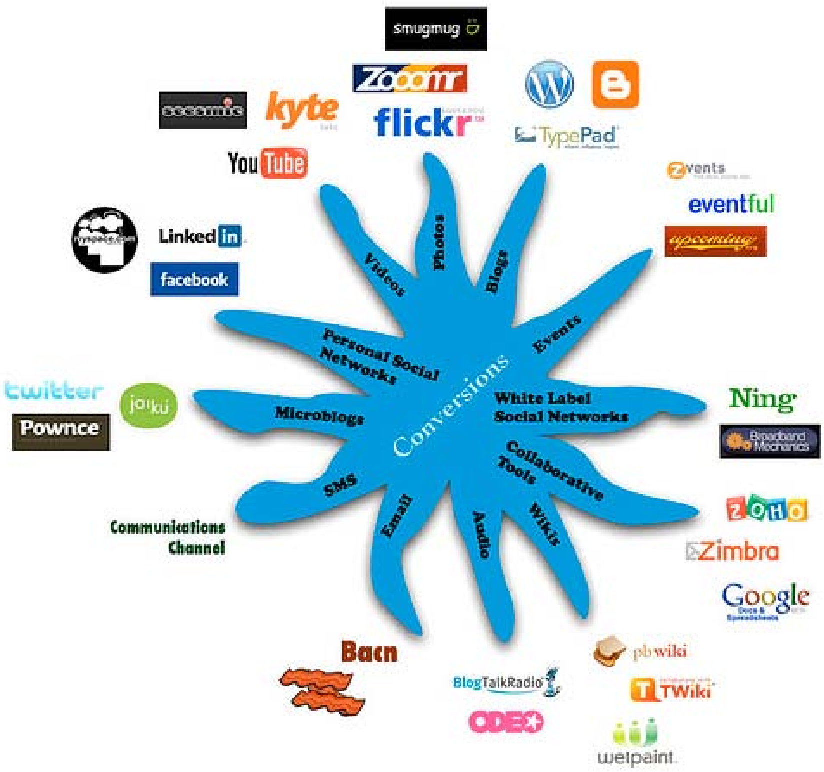
The 21st century is compelling adults to become lifelong learners as they change jobs, and even professions, more frequently. To keep abreast of their profession, and remain competitive, they choose to learn, have a clear knowledge of what they want to learn and why they want to learn, and are highly motivated learners. Many adult learners often do not have the time or motivation to physically attend traditional classes. Learning online is a practical, speedy, and time-saving approach to satisfy their needs. They seek 'just-in-time' learning rather than 'just-in-case' learning to fulfill these needs.

Adult learners have different expectations, priorities, and time limitations, as well as fears regarding online learning from young adults and very young learners. Security, privacy, ease of technology, and finding the time to learn are factors to be considered in their professional and personal lives. The educator must not only cater to adult learning styles but must be able to choose an appropriate technology to support this online learning.

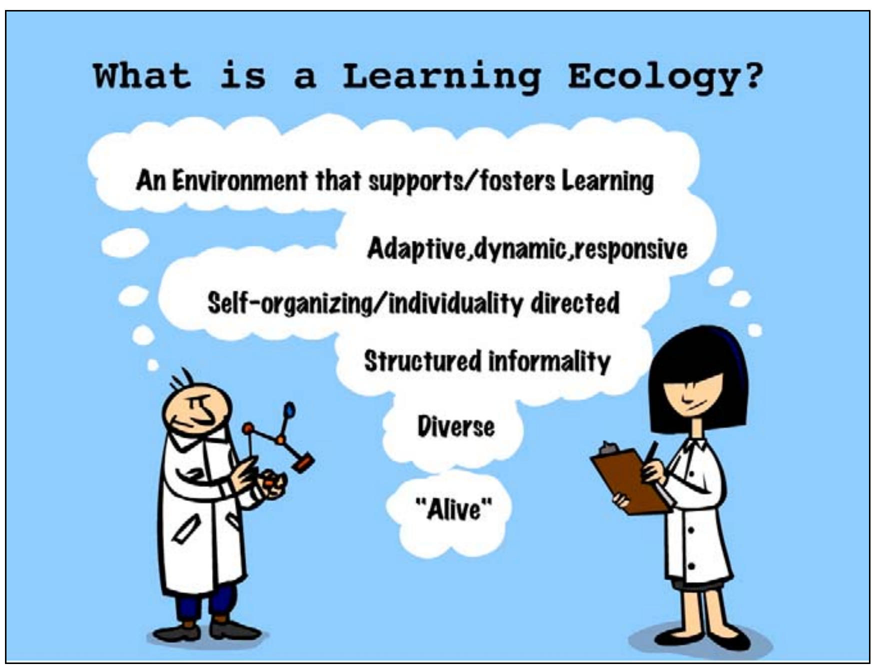
Emerging technologies are making this task easier for educators, but the plethora of new tools complicates the choice. In the mix of working adult learners who bring with them their own learning experiences and knowledge and their own expectations, any chosen technology must support a learner-centred approach, enabling a shared responsibility for learning and enabling the learner to develop their own network of learning.

Blogging, while a well-known concept, is not necessarily a familiar tool to working adult learners. By creating a private group within a social network blog, learners are placed in the centre of their own learning, without infringing on their privacy and without rendering their corporate information public. This privacy and security is particularly reassuring for newcomers to online learning, and enables learners to develop their own network of learning in their own time and at their own pace. Because a blog can be accessed at any time during the course, and after the course ends, this approach eliminates the problem of an abrupt end to a course, allowing distributed learners to continue to develop their own networks.

Asynchronous learning does not satisfy the learning styles of all learners, nor does it provide the necessary human contact, socializing, and real-time communication which purpose-led working adults require. The combination of asynchronous and synchronous tools offers kinesthetic, auditory, visual, and tactile support for learners. (See general overview, http://otis.scotcit.ac.uk/onlinebook/otisT102.htm.) E-learning that integrates social media offers flexibility, convenience, and sociability for the adult learner.



Robert Scoble (November 2007) and Darren Barfoot



George Siemens 2006

Adult language learners

> "People are generally persuaded by the reasons which they themselves have discovered than by those which have come into the minds of others". – Pascal

English is today the common language of the professional world and it is no longer a luxury asset but a basic tool for the working adult, just as is word processing. Working professionals either choose language coaching or are instructed to do so by their employers. E-learning in the corporate world is gaining ground as being more cost effective for both the company and the adult learner than traditional classroom learning (Strother, 2002). It is also more convenient for the adult learner who may choose to do this in the work place or in the convenience of his or her home, or in the hotel, while commuting, or in the garden.

Adult learners have a wealth of real-life experiences, knowledge, and expectations. A theoretical familiarity with adult learning should be part of any online educator's preparation. Knowles, is regarded by many as a leader in the field on andragogy, the term now coined for adult learning theory (Hiemstra, 1990). Some assumptions about adult learners include:

- They need to know the purpose of their learning.
- The learning must be relevant to their real-life needs, both professional and personal.
- Learning is self-directed.
- Adult learners want their knowledge to be recognized and used.
- Personal or incentive-based motivation supports learning.

Adult learners are also individuals, with personal learning styles. Much work has been done on interpreting and catering to individual learning styles. As e-learning is not just about technology, but above all the human factors and the need to humanize online learning, a broad understanding of adult learning styles is essential for the online educator. Three factors identified by Birch (2002) which influence the success of online learning for the adult learner are management of the e-learning environment (self-directive competencies), interaction with the learning content (metacognitve competencies), and interaction with the virtual learning facilitators and learning peers (collaboration competencies). Long (2000) identifies the dimensions of motivation, metacognition, and self-regulation, which are supported by choice, competence, control, and confidence.

Online pedagogy: best practice and theories

> "I am always ready to learn although I do not always like being taught". – Winston Churchill

Online pedagogical best practices are currently the focus of much research, as the educational and corporate sectors adopt some form of e-learning, either fully online or hybrid. To date, and as a general basis in the design and delivery of online learning, many educators and trainers have made reference to the previous learning practice and works of Bloom, Chickering, and Gagne.

Bloom's Original Taxonomy	Anderson's Revised Taxonomy
Knowledge	Remembering
Comprehension	Understanding
Application	Applying
Analysis	Analyzing
Synthesis	Evaluating
Evaluation	Creating

Bloom's original taxonomy (1956), revised by Anderson (2001)

Many instructional designers refer to Gagne's (1992) categorization of learning into intellectual skills, cognitive strategies, verbal information, motor skills, and attitudes, and to his nine steps in e-learning:

(1) gaining attention
(2) stating the objective
(3) stimulating recall of prior learning
(4) presenting the stimulus
(5) providing learning guidance
(6) eliciting performance
(7) providing feedback
(8) assessing performance
(9) enhancing retention and transfer to other contexts

Chickering's (1987) seven principles can be the basis of all forms of online learning. Good practice in undergraduate education:

(1) encourages contact between students and faculty;
(2) develops reciprocity and cooperation among students;
(3) encourages active learning;
(4) gives prompt feedback;
(5) emphasizes time on task;
(6) communicates high expectations; and
(7) respects diverse talents and ways of learning.

"New technologies can communicate high expectations explicitly and efficiently. Significant real-life problems, conflicting perspectives, or paradoxical data sets can set powerful learning challenges that drive students to not only acquire information, but sharpen their cognitive skills of analysis, synthesis, application, and evaluation". (Chickering & Ehrmann, 1996)

Social network blogs with the working adult learner

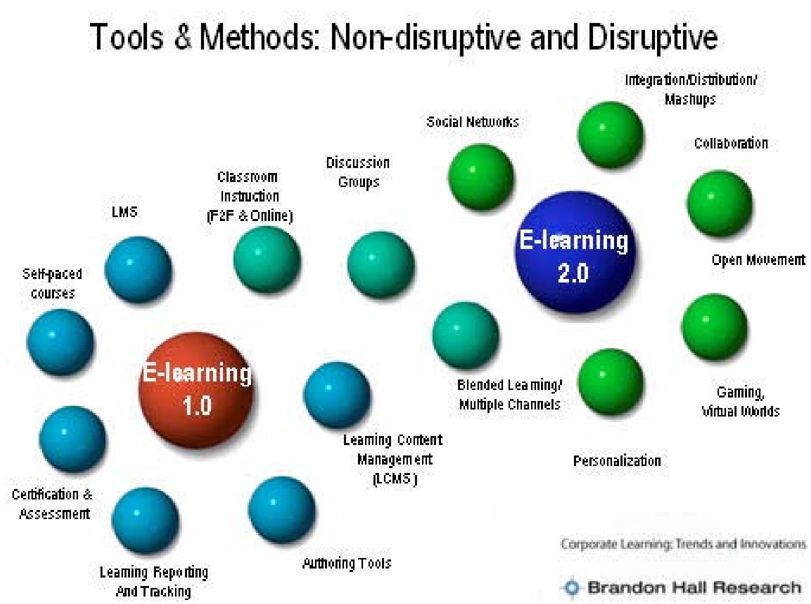
"We are all natural lifelong learners. All of us, no exceptions. Learning is a natural part of being human. We all learn what enables us to participate in the communities of practice of which we wish to be a part". – Seven Principles of Learning; IRL

The harnessing of collective intelligence through the use and flexibility of social media leads to empowered learners in enhanced learning conditions in a sometimes disordered flow of active participative learning.

The increasing popularity of social media 'by the crowds' and rapid software development have led to significant financial investment in some programs and have enabled further rich features. Some blogs now include integrated forums for discussion, multimedia uploading features, audio and video response features to posts, and mobile connectivity. The ability to form single owner blogs, group blogs, and social networks are part of these enhanced features. Bloggers can choose to keep their blogs private, accessible only to certain groups or selected individuals, or to be available to the public. Users have the choice. This sense of proprietary emphasizes community and collaboration in blog-based online learning.

Blogs are easy to use, allowing authors to edit their written messages even weeks later. Bloggers can write the content, personalize the look and feel of their individual blog, group blog, or page within a network, and carry out constant updates with minimum hassle or knowledge of web-based applications. Unlike a wiki which can allow universal editing rights to all users, blogs allow only their authorized authors to edit their own postings. For learning a language this is a particularly rich feature, allowing the learner to correct their own work after group or peer feedback, rather than depending on a teacher's correction. This shift towards giving the learner control over the learning process enables the learner to express him- or herself in an authentic voice, facilitated, but not dominated, by a predetermined syllabus. However, community-driven blogs lack some advantages of traditional LMSs such as class management, grade-tracking systems, attendance, and individual student activity reports, which academia normally requires.

Currently many social software programs are undergoing substantial improvements and technological additions in the quest to attract and engage the users. As users adhere to these technologies, the requirement for voice communication becomes more pertinent, especially for language learning.



A social network blog offers several possibilities for adult language learners. This technology offers the possibility to set up a blog within a network, without the learner being 'overcome' by the social networking in the initial stages. Many working adult learners want to find what they need in one place, and quickly. By setting up a group (private or public), learners can access all they need within one space rather than in many spaces. This is reassuring for adult learners who do not desire information overload, and in particular for those new to online learning. With time, reassurance, and increased confidence, they can create their own networks outside the learning network at their own discretion and for their own purposes. These networked multimedia computer technologies lend themselves to the active engagement of learners, empowering the learners in their own learning, leading to pro-active and self-directed learning, and the eventual creation of their own personal learning environment.

EXAMPLE: MULTIPLY

Among the multitude of social media technologies available today, one example of a social network blog is "Multiply" (http://multiply.com) which claims to be a social network with a difference. It is described as a social media aggregator with a privacy-centric multimedia sharing social networking service, enabling granular control. For some adult learners, the idea of social networking in Facebook (www.facebook.com), MySpace (www.myspace.com), and many others is daunting and not precisely what they want in purpose-led learning. Multiply is one among many technologies that attempts to provide many features within one space. By creating a private group within a network, the learners have a safe area to learn and can venture into the network when they are ready. Each user has a personal blog, in addition to and separate from the group blogs.

For language learners and educators, Multiply offers many features within one space, thereby eliminating unnecessary time and effort spent logging in to different spaces for access to different tools. A toolbar installed in the browser enables instant access to the blog and the ability to post content directly, and it has a new Message Alert button that updates automatically. The inbox shows all recent updates and can be customized using the custom filter according to user preferences. The Search button enables users to quickly search public content on the Multiply social network. Within a Multiply blog site, documents can be uploaded as attachments to a post. Five files can be attached per blog post with a maximum 100 megabytes per post. This is beneficial to the learners who are uncomfortable reading from the screen, as they can download the document, change the font, review, then print it. Before finally saving and publishing a post, saving as a draft is optional and the blog has a preview and spell-check feature, together with a rich text editor and an HTML editor.

Videos can be uploaded without using a third party to host them, or imported from third-party hosts to the video category, or embedded directly within a post using the embedding code. Audio files can also be uploaded. Other features include the ability to upload photos and photo albums, enabling all users to share content. In addition to text replies, replies to posts can be made directly in the blog using the integrated audio or video features. For language coaching and instruction, this is extremely useful as learners can record, play back, and fine tune their own oral message before posting replies. The direct video recording feature is effective for language communication as it raises awareness of linguistic and paralinguistic information, and it is a very useful tool for rehearsing teleconferencing, presentations, and interviews. This feature also assists auditory and visual learners as the information can be reviewed with particular attention to speech and pronunciation. Feedback can be provided aurally, visually, and using text. In addition to uploading or embedding recordings of guest speakers to the learning community, invitees can address the blog directly and respond to the learners by posting aural or video replies to questions or comments posted by the learners.

An integrated poll/survey feature further enhances interaction with the blog content. The Review box can be used for feedback and evaluations of films, literature, and images can be uploaded with the five-star rating system. The integrated calendar can be used for scheduling events, real-time meetings, course dates, and holidays, to name a few examples. Although this technology does not track usage and completion of activities, it does track visitors to individual blog posts and pages, which is of importance to a trainer wanting to know whether assignments have been accessed, when, and by whom. The date and time is given for each visitor or group participant. The photo icon of each post personalizes the whole online environment for all users. The personal message board can be used by any member to send messages to selected Multiply users. Relevant website URLs can be collected separately on the Link Page, enabling users to collect and share resources.

When the email alert feature is activated, all group members are notified of new blog content by email, as illustrated above, and learners can respond directly while still viewing the email. Blog entries, together with photos, videos, and links, can be posted directly to the blog from any email-enabled device, using the cell phone, Blackberry, or any device with a web browser and Internet access. The Multiply Mobile has an interface specifically designed for small screen devices, and users can use nearly all the features in the mobile social networking version (http://multiply.com/m).

Figure 27.1

With Live Replies enabled technology, users can follow discussions in real time, similar to IM or a chat room. This means that groups can work on the blog content at the same time, as posts and edits appear instantaneously. To further enhance the language learning process among distributed learners, real-time meetings can be held using teleconferencing, or dual VoIP tools such as Skype for direct voice communication. Discussions, debates, conversations, presentations, and role-playing can be carried out, based upon the blog content or other content. On-the-fly changes can be made in live voice meetings, allowing participants to share documents on Skype or by posting directly to the blog for discussion and analysis, together with web surfing. These voice calls can be recorded and uploaded for later investigation and discussion, and eventual discourse analysis. The real-time textchat in the VoIP tool (Skype, Oovoo, Google Mail) chat area can be copy-pasted as a further record of the real-time input onto the blog. In such sessions, a trainer can write all the vocabulary or points of grammar that may come up in the real-time conversation. This enables the learners to keep a record, to access learning events for further work, and to enable those unable to attend to catch up.

The relational granularity within this program allows authors to make selective posts to individuals, groups, the network, or selected groups of contacts. Pair work and group work can be organized within a private group using this feature.

Multiply has an Ajax/Web 2.0-based interface. The look and feel of the blog environment can be adapted to the group and by the group at any time, depending on administrative rights given to the group users, and those with CSS knowledge can apply their skills easily within this technology to totally personalize it and add widgets. The network community itself is very responsive to requests for help, and joining other public groups within the network is a simple click.

The tagging feature shown in Figure 27.1 enables users to organize their posts for easy recall by topic, incrementally building a collective knowledge base. Customizable tag boxes can be added to, deleted, and edited on each post at a later date. A customizable tag cloud can be displayed on the home page. A further feature is a Tagged Content Box for the preferred posts within the blog content. Social bookmarking is integrated into the software, enabling learners to bookmark content in the social network and in their group. This feature also enables the user to bookmark sites outside the social network, integrating the resource as a link within an automatic blog post to share within the group. Multiply user blogs and groups all have RSS feeds, to be used on an RSS reader. The free proprietary software offers unlimited storage space for each blog.

This is be no means a recommendation to use one specific social network blog, but a working example of real-life learning in the online environment, deploying freely available technologies to satisfy the learning purpose.

Summary

> "The heart of Web 2.0 is the user … The tools power it, but the people do it". – Susan Mernit

Social media such as I have discussed in this chapter allow working adult learners to be connected, and encourage them to use all four language skills of reading, writing, listening and speaking.

The cluster of technologies in one support does not overload the learner in their immediate need to learn what they need to know to access their learning environment at any time, and anywhere.

The online environment engages the learners in discussion, collaboration, exploration, production, discovery, and creation.

Adult learners have the choice to create and develop their own personal learning environment.

Glossary

CMS. Content Management System
LMS. Learning Management System

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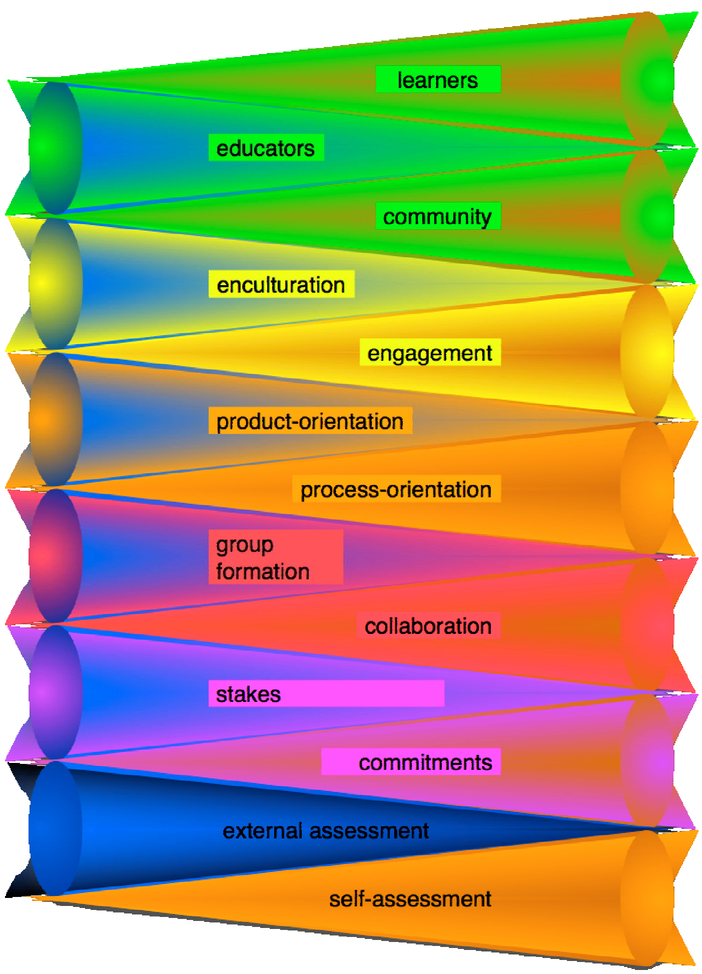
28
Online Collaboration: An Overview

Paul A. Beaufait, Richard S. Lavin, and Joseph Tomei

Collaborative efforts are just as much about understanding conditions for collaboration in coordinating work, as … [they are] a matter of collaboratively constructing knowledge.
– Guribye, Andreassen & Wasson (2003), p. 385



Learning outcomes

After completing this chapter, you should be able to:

- Understand what collaboration entails and how to foster and facilitate it.
- Understand the theoretical and practical issues surrounding collaborative and other kinds of collective endeavours.

Introduction

In this chapter we explore the notion of collaborative learning from theoretical and practical perspectives. The first step is to distinguish collaborative from cooperative learning, because much so-called collaborative learning, although collective and often cooperative, is not necessarily collaborative. By getting a clear understanding of what we may not be doing when attempting to foster collaboration, we can formulate clearer ideas of what else is possible and what is transferable to online learning and working environments. This chapter is rich in references that tie into learning theory and primary literature that interested readers may wish to explore. It concludes with stories and reflections representing online educational collaboration from learners' and educators' perspectives.

Point of departure

As cooperation and collaboration take on increasing importance in workplaces, societies, and the world as a whole, it is natural that, in order to prepare learners for this world, educators are also taking an interest. However, most schools do little to promote either self-directed, collective learning endeavours or the development of skills that students need to listen effectively to one another, addressing "complex issues and problems that require different kinds of expertise" from those that they currently may study or emulate in school (Bielaczyc & Collins, 1999, p. 272). With rapid development and expansion of technological infrastructures, possibilities for harnessing technology to enable collaboration are expanding. Yet, as we move to take advantage of these possibilities, we encounter new challenges and discover unexpected complexities in fostering collaborative endeavours online.

Here we offer an overview of collaborative learning, particularly in adult and higher education. We first define cooperation and collaboration, then explain why they are desirable, and we outline what you need in order to achieve them, examining both issues specific to working with technology and those that are common to online and offline situations. Finally, we look at broader issues involving cultures of collaboration and possible future directions for collaborative learning. This overview will serve as background for the stories that follow.

Definitions and distinctions

> "When a word becomes fashionable—as is the case with 'collaboration'—it is often used abusively for more or less anything." (Dillenbourg, 1999, p. 1)

Though there are no hard and fast definitions of collaboration and cooperation, generally we perceive them to differ in emphases along the following dimensions, with the more collaborative elements on the right (Table 28.1).

Table 28.1. Dimensions of Collective Work

Cooperation	Collaboration
products	processes
collocations	syntheses
division of labour	mutual responsibility
work environments	learning environments

Since it is easy to confound the terms cooperation and collaboration, or to use them virtually interchangeably due to their similar Latin origins meaning to work together, we would like to draw a working distinction between cooperative and collaborative learning endeavours from McInnerney and Roberts (2004), who hold that "the term collaborative should be used for those learning techniques that emphasize student-to-student interaction in the learning process, while the term cooperative should be used where students are required to work in small groups, usually under the guidance of the instructor" (p. 207). This distinction resonates in Finkelstein's view of guidance: "Although the presence of a facilitator can guide collaborative activities, these interactions tend to be more egalitarian in nature and can happen at any time, in both structured and informal settings" (2006, p. 3).

Panitz recognizes similar processes in both cooperation and collaboration, such as learner grouping and tasking, and then the sharing and comparing of "procedures and outcomes" (Panitz, 1996, para. 7). However, for cooperation, Panitz asserts, those processes enable learners to achieve goals and create products that are "usually content specific", that teachers determine and control, while "collaborative learning is more student-centred" (Panitz, 1996, para. 4).

An important dimension of collective endeavours that Lavin and Tomei examine in Wiki Technology for Online Education (Chapter 25, Tools for Online Engagement and Communication) is the relative emphases placed on process and product. Product orientation characterizes cooperative endeavours, while process orientation reflects more collaborative ones.

Other distinctions to note between cooperative and collaborative activities concern the level of interdependence among learners, the nature of group roles—leadership in particular—and the complexity of interaction. For practical purposes, let us define interdependence as "a dynamic of being mutually responsible to and dependent on others" (Wikipedia, Interdependence).

Typically, the term collaborative applies when the level of interdependence among learners is higher and when group members' roles overlap to a greater degree than in cooperation. Whereas Dirkx and Regina consider "level of interdependence" and "learner accountability" crucial (2004, p. 155), Graham and Misanchuk consider fostering interdependence and accountability as "key challenges" in structuring computer-mediated group activities. Further, they argue that interdependence needs to be higher for collaborating than for cooperating groups (2004, pp. 183–184).

Dillenbourg defines collaboration as convergence of "three concurrent processes, which are neither independent of each other, nor identical," namely processes of communication, coordination, and problem-solving (2002, p. 22). Ingram and Hathorn view collaboration as "a more complex working together" than cooperation, particularly with regard to "the interactions and effectiveness for instruction and education" that collaboration entails (2004, p. 216). Their definition is consistent with the others, but adds criteria of equality, authenticity, and synthesis. Thus, for Ingram and Hathorn, collaboration requires "roughly equal participation, genuine interaction among the participants, and the synthesis of work into a unified whole" (p. 215). At its best, wiki work typifies that unification, as Lavin and Tomei explain in Wiki Technology for Online Education (Chapter 25, Tools for Online Engagement and Communication).

Graham and Misanchuk also distinguish learning groups from work groups as they examine "benefits and challenges of group work in online learning environments" (2004, pp. 181–182). Throughout this section, we will focus on learning groups that Graham and Misanchuk might characterize by: "flat leadership", fuzzy roles, valuing learning over productivity, focusing on processes rather than outcomes, and assuming group responsibilities as often to learn skills as to use them (p. 185).

Benefits of collaboration

> "Among the most highly regarded of these skills can be counted the ability to work productively in teams, in both social and work settings, especially in situations where the various team members may have diverse backgrounds, experiences, and opinions. Indeed, it is in just such an environment that collaborative work can bring the greatest benefits." (Roberts, 2005a, p. vi)

Collaboration sounds like a very desirable thing, but for educators to change what they do, we need to spell out the potential gains. Benefits of collaboration that scholars often mention include: amplification of learners' intellectual capacity; meta-cognitive skills, that is, powers of thinking about thinking, including planning and evaluation of learning processes; plus social and job skills. We also imagine that as collaboration is made more integral to the process of education, we will see it used effectively in other domains. There is nothing that prevents these other areas from embracing collaboration and leapfrogging ahead of education, so we feel that many of these basic notions can be effectively employed in any online environment, whether educational, professional, or vocational.

According to Graham and Misanchuk (2004), theoretical benefits of learning through social interaction, or collaboration, derive from synergy within groups enhancing members' thinking and organizational skills, promoting insights and explanations, and encouraging greater achievement. Similar benefits deriving from cooperation entail risk-taking and perseverance, retention of what is learned, meta-cognitive skill development, creativity, and transferability.

Roberts argues that learners stand to benefit as much from "collaborative learning within a computer-supported environment … as within a classroom or lecture hall … [because] fruitful and constructive discussion and dialogue can take place at any time" (Roberts, 2005b, p. 4). Likewise, Klemm concludes that face-to-face collaboration techniques transferred online can lead to "better student learning and achievement" (2005, p. 198).

Whether in the classroom or outside, exploiting links to prior knowledge can enhance the entire learning process and lead to the development of interpersonal intelligence in critical thinking communities. Chamot suggests that interactive teaching can raise learners' awareness of their prior knowledge and enable them to develop new knowledge that is "shared and constructed rather than transmitted one way from teacher to students". Collaborative teaching allows students and teachers to work together to "discover, create and expand their understanding and skills". The aim of such collaboration is to develop interpersonal intelligence, or "the ability to understand and respond effectively to others" (Chamot, 1995, p. 4).

In multi-cultural settings, this kind of interpersonal intelligence would encompass intercultural understanding and communication, with classrooms, virtual learning environments, and online work environments created for a specific purpose serving as exemplars of communities. Through discussion and analysis of participants' thinking, leaders can raise meta-cognitive awareness, enabling them to choose appropriate strategies to enhance the efficiency of their learning. Taylor suggests that benefits also include "building self-esteem, reducing anxiety, encouraging understanding of diversity, fostering relationships, stimulating critical thinking, and developing skills needed in the workforce" (2005, p. 24).

Conditions for educational collaboration

While we focus on educational collaboration here, education is not restricted to the academy but is applicable to any situation where it is desirable for participants to improve in order to help a community grow. Thus, Haavind's four key elements for online collaboration can be thought of as basic:

(1) Socially bonded communities of learners
(2) Collaborative activity designs
(3) Explicit scaffolding or teaching of how to collaborate
(4) Evaluation of collaborative participation (Haavind, 2006)

To engender collaboration for purposes of making or improving something, from an educator's perspective, Currie suggests focusing on several key factors: intent to collaborate, characteristics of target populations, types of member interactions, time frames, and the existence or necessity of guidelines, rules, and governance (personal correspondence, March 10, 2006). This is very much in line with Dillenbourg's (2002) analyses of computer-supported collaborative learning scripts in terms of: (1) what tasks learners must complete, (2) how groups form, (3) how groups distribute responsibilities, (4) how learners (and groups) interact, and (5) when task work and interactions occur.

Raising what by now should be a familiar challenge to promises of online, anytime, anywhere, learning, Dillenbourg underscores the necessity and expense of tutelage:

> "Regulating collaborative learning is a subtle art. The tutor has to provide prompts or cues without interfering with the social dynamics of the group. Light human tutoring is a necessary, but expensive resource for computer-supported collaborative learning." (Dillenbourg, 2002, p. 2)

Chamot (1995) emphasizes the importance of a strong teacher presence, and this may be even more important with non-traditional students and in English as a Second (ESL) or Foreign (EFL) Language settings. Sorenson suggests that collaborative learning calls not for "decomposition of the learning content or tasks", but rather for "supporting learners' navigation through meta-communicative levels" (2004, p. 257). Thus collaboration should involve more than talking the talk of collaboration; it should entail talking the walk, that is, communicating about the hows and the whys of both processes and products of collaboration.

Interdependence, by definition, characterizes collaboration, but entails challenges and risks as well. Graham and Misanchuk (2004) explain: "The higher the level of interdependence between group members, the greater the communication overhead [time] required to complete the learning task." They also suggest "individual learning can be compromised if there is limited interdependence in a learning group". Although mature groups that they studied could ascertain "the level of interdependence with which … [the groups themselves] were comfortable", Graham and Misanchuk highlight cases in which "groups chose an efficiency focus over a learning focus" (pp. 193–194). In other words, those groups' interactions were more business-like than educational, and arguably more cooperative than collaborative.

It is worth noting here that none of those definitions, conditions, or strategies for fostering collaboration focuses on technology per se. Subsequent sections point to possible additional benefits of using certain computer-based environments (for example, see Chapter 25, Tools for Online Engagement and Communication, on blogs and wikis), but such environments also have their own demands. Their very novelty means that we have yet to fully understand their true nature, and, as Sorenson (2004) suggests, this may mean that we have yet to reap their benefits to the full.

Issues and solutions

Fostering and facilitating collaboration is no cakewalk. Pedagogical and technical problems are part and parcel of collaboration, as are information management and communicative workload problems (Daradoumis and Xhafa, 2005).

GROUPING

Group social relationships form the core of collaborative endeavours, and, according to Shirky (2003), it is impossible to separate them completely from technological issues. However, since careful group formation, consolidation, and commitment building are clearly conducive to success in collaboration, let us consider those first and leave examination of tools for subsequent chapters.

Group formation

Issues associated with group formation become very important at the earliest stages of collaborative projects. One possible approach is the "radical model" that Roberts points out (2005b, p. 8; in Learner Assessment and Peer Evaluation Protocols). The radical model calls for random assignment of learners to groups but may be among less desirable alternatives when striving to engender anything like socially bonded communities of learners (Haavind, 2005). Taylor suggests that effective collaborative groups require "group composition of optimal heterogeneity" and that "difference of viewpoints is required to trigger interactions" (2005, p. 23).

As educators, we may find that group formation is better not left to chance. That is even truer if we agree that Daradoumis and Xhafa's collaborative group formation methods are "dynamic collaborative processes" leading both to "better learning outcomes" for learners and to "professional development in a networked learning environment" for educators (2005, p. 221). Although devoting an extended period of time to group formation may be a luxury that not only adult and tertiary educators but also leaders in the workplace feel they cannot afford, it behooves us to examine one such process for means of learner engagement that could also work on the fly.

Daradoumis and Xhafa prescribe a four-phase, eight-day long process solely devoted to group formation, beginning with a two-day group analysis of a case study on collaborative group work, the purpose of which is to familiarize learners with whether and how groups collaborate effectively. The second phase (one day) consists of learners sharing information about themselves that they deem relevant to the tasks ahead, including: "personal data, expertise level, work pace, available working time, temporal coincidence, goals, … [as well as their] attitudes towards collaborative learning, social aspects of collaboration, and previous experience in group work". The final two phases of group formation take five more days: four for negotiation of actual group memberships, plus one for putting group membership proposals to tutors for their approval (2005, pp. 221–223). Though we question whether learners could share so much information about themselves, their goals, and their attitudes, in as little as one day, especially considering multiple time zones or locations around the world, with the exception of the case study analysis this whole process reflects similar yet satisfying group formation summarized in a later section in this chapter, Beyond the Mines of Bhoria.

This sort of group formation is an intensive hands-on process involving educators in "supervising, guiding, and motivating students through the whole process", as well as in "organizing and restructuring" learners' online environments, as necessary, in order to alleviate learners' interaction workloads, and to facilitate identification of suitable group mates and location of groups in the process of formation. Not only educators, but also learners, should pay particular attention to the "degree of commitment" shown by one another during group formation (Daradoumis & Xhafa, 2005, p. 224), because commitment is a key indicator of success in collaboration.

Group consolidation

Once learners make commitments to join groups and get approval from course supervisors if necessary, the induction process should continue, because group formation alone is not enough. Group consolidation is of equal importance, because success depends on whether individuals continue to engage in group activities and deepen their relationships with one another. Daradoumis and Xhafa (2005) attribute many collaborative failures to lack of ongoing commitment by members to their groups and mutual purposes. To assure such commitment, groups need ongoing guidance, engendering trust and facilitating self-determination. Addressing all foreseeable challenges is no easy matter.

Striving to obtain and incorporate learner input from group goal-setting onwards is a challenging way for educators to extend the range of collaborative activities that they foster and facilitate. Gathering learner input early in an online course can create opportunities for learners to take initiative, to demonstrate or develop leadership skills, and to negotiate commitments and leverage engagement in more collaborative activities to follow. One such activity could be determining when and how to engage in collaboration.

How much input should learners have when determining the rules of engagement? This is important because, according to Currie, the existence or necessity of guidelines, rules, and governance define collaborative groups (personal correspondence, March 10, 2006), regardless of whether these guidelines come from educators or learners.

Daradoumis and Xhafa propose that learners consolidate their group by coming up with their own "specific and flexible" guidelines for group interaction (2005, p. 226). They argue:

> A clear identification of the [learning and social] goals and the responsibilities of each member will result in elaborating an adequate working methodology, good planning and timing, and fair and viable assignment and distribution of the constituent tasks to be performed. (Daradoumis & Xhafa, 2005, p. 227)

It is unfortunately true that the greater the number and complexity of collaborative activities you plan, the more chances there are for problems to arise at any point in the process from group formation to self and peer evaluation. Pedagogically, when group work and production are highly collaborative, individual evaluation is a problem. Technically, when "frequent, or even intensive, interactions for decision-making or conflict resolution" are necessary, asynchronous communication may not suffice. Moreover, collaborative activities are typically time-consuming. For example, Daradoumis and Xhafa (2005) allocate a period of a week for group consolidation alone, which is more time than educators on tight schedules may wish to invest towards fostering learner collaboration unless they are responsible for design and implementation of courses of study that bridge semesters or span years.

Perhaps more important, from learners' perspectives, intensive collaboration may generate huge quantities of information. This information, if unmanaged, may lead to information overload and withdrawal from groups. If group members must manage this overload, information management activity may interfere with so-called "real work and learning" (Daradoumis & Xhafa, 2005, p. 228). Thus, concerns about speed of progress may precipitate educators to intervene by assigning groups and roles; setting assignments, tasks, and schedules; pre-authenticating resources; and controlling or prescribing rather than scaffolding evaluation processes.

Although adopting such time-saving tactics may satisfy educators' and even learners' desires to enhance productivity, it also can diminish opportunities for learner collaboration, and thus for learners to acquire skills and proficiency in planning, regulating, and assessing collaborative endeavours. Given administrators' affinity for quantifiable learning outcomes and concerns about time schedules, it is all too easy for educators under time pressure to adopt a product-oriented approach. However, unless and until learners invest thoroughly in collaborative activities, engaging intensively and over extended periods of time (for example, see Bonnie's Story below), they may fail to acquire the skills necessary to carry out collaboration with near-peers in educational or in future work environments.

In educational environments, all these points weigh towards the aim of educating the target population, but in the workplace other factors may override these considerations. Yet we would like to underscore the following four points from educational research into collaboration:

(1) Allow as much time as possible for groups to share information that may not appear immediately relative to the task at hand.
(2) Allow groups to develop their own guidelines for group interaction.
(3) Beware of information overload, and realize that an important part of the collaborative process is managing the information produced.
(4) Be prepared to deemphasize the product in favour of developing collaborative skills, so as to permit group members to invest thoroughly in collaborative activities.

Community building

> "In a learning communities approach … students become responsible for their own learning and the learning of others. Students also develop ways to assess their own progress and work with others to assess the community's progress. In contrast, in most classrooms the teacher is the authority, determining what is studied and assessing the quality of the students' work". (Bielaczyc & Collins, 1999, p. 275)

Community building figures prominently in a later chapter but is worth briefly mentioning here. In order for a collaborative culture to flourish, there needs to be some sense of community, and a prerequisite for community is an atmosphere of comfort, sharing, and trust, as highlighted by Neal (2005b). However, it is no easy matter to create such an atmosphere, and it takes time.

For example, Riel, Rhodes, and Ellis (2005) find that although learning circles provide a suitable structure for peer review, it is not always easy to build a sufficient level of trust in the short time available in a typical course. For that reason, educators may opt for practical approaches, including technical training, rather than trying to foster and facilitate more complex collaborative structures.

The Concord Consortium model for quality online courses presents community-building activities as but one of nine key program elements. Proponents of this model assert that "learning through collaboration requires participants to take intellectual risks", and that it is necessary to "nurture a community culture in which participants are supportive and honest". This model presupposes that failures are okay, as long as they become learning experiences, and the model relies upon trained and experienced facilitators "to foster this sense of intellectual trust and safety" (Concord Consortium, 2002, pp. 1–2). One source of such training is PBS TeacherLine (http://teacherline.pbs.org/teacherline/about.cfm).

The Concord model for community building encourages educators to make "expectations about good group processes" explicit, and to use "inclusive and collective language that focuses on content" rather than individuals. Setting aside time for the participants to get to know each other is "an essential first step" (Concord Consortium, 2002, p. 2). Educators who follow this model also exploit a host of other "techniques for building and maintaining group cohesion", including "anonymous polls, role-playing, use of smaller discussion groups with rotating roles, or weekly online meetings" (Concord Consortium, 2002, p. 2).

All of those suggestions imply recognition that learner communities manifest both educational and social dimensions. Those suggestions may serve to underpin what Bielaczyc & Collins call "community identity" development by fostering "a collective awareness of the expertise available among members of the community" (1999, p. 275). For more on community building, see Chapter 30, Supporting E-learning through Communities of Practice.

BLENDING

Blending venues, modes, and media presents learners with opportunities as well as challenges to experiment with various forms of interaction that they may find useful for collaborative endeavours. While White (2003) asserts that collaboration can occur online, she suggests expanding the concept of blending. So, when we advocate blending, we mean not only online and offline activities (Harris, 1995), but also synchronous and asynchronous (time-delayed) interactions (Knowplace, 2006), using various means of computer-mediated communication and involving individual as well as collective endeavours (White, 2003), including self- and peer assessments.

Both assessment and blending are issues that emerge in a later section in this chapter, Learners' Stories of Online Collaboration. We also explore assessment in Assessment Schemes for Adult Learners (below).

For instance, Harris (1995) advises subsuming collaborative activities to curricular goals, yet is against conducting such activities online when learners can participate more readily face-to-face. Similarly, Dillenbourg points out that many scripts capable of promoting collaboration actually integrate individual and collective activities. Dillenbourg favours face-to-face work whenever feasible and advocates group formation defaults that accommodate match-ups by geographic proximity and availability to meet (2002, p. 13). He also highlights scheduling of critical activities during limited opportunities for busy adult learners to actually meet face-to-face (p. 16).

In telecommunication mode, Federer (2003a) finds that, though some learners are capable of immediate responsiveness, others need time to formulate and communicate their ideas. However, since intensive combinations of both synchronous and asynchronous communication within short time frames take their toll on both online educators and learners, Federer advocates combining data from both learner surveys and facilitators' logs to find "optimum times … for online vs. offline collaboration" (2003b).

According to Finkelstein, synchronous online settings "offer an immediacy that not only allows collaboration to begin instantaneously, but also diminishes the actual time spent on task" (2006, p. 4). For both online courses and work groups, Neal suggests starting with early, intensive, synchronous activities as a means to generate group energy and to create a social context for subsequent, time-delayed interactions (2005a). Such activities are consistent with recommendations for community building.

TOOLS

> "Increasingly, course approaches (constructivist approaches) are adopting group work and collaboration on projects as assessed course activities, and students are largely stuck fumbling with sharing Word documents in a discussion forum, through IM, or through email. Obviously, distance students don't have the luxury of being able to meet face to

> face to work on projects together, and even if they can, sometimes it's not always the most efficient way of getting something done." (Morgan, 2005)

Some kind of asynchronous interactive environment that allows social interaction is necessary to enable collaborative learning activities, but discussion boards, familiar tools for many online educators, frequently provide insufficient structure to engender collaborative discussions.

Dillenbourg argues that "an important ergonomic feature [of remote interactions] is the *degree of integration of task interactions and social interactions*" (2002, p. 17 [italics in original]), or the extent to which specific tools allow learners to communicate upon what we might call learning objects. Yet he points out drawbacks of such integration for learners who prefer to use familiar communication software such as chat, discussion boards, or email for various interactions.

However, as Moore and Marra assert, when contributions to discussion boards "lack focus or the board content becomes confusing, … this critical component of an online course can both be an ineffective communication tool and actually impede learning" (2005, p. 191). They surmise that "empirical evidence to indicate that text-based communication used in computer conferencing can facilitate higher-order and critical thinking is only just emerging, and not entirely consistent in its results" (p. 193).

Some educators opt for increasingly structured approaches yet may not achieve the results they desire. For example, Dillenbourg suggests "a certain degree of coercion [scripted interaction] is required for efficiency reasons, but too much might be in contradiction with the very idea of collaborative learning and might decrease student motivation" (2002, p. 20).

Balancing rules, structures, scripts, protocols, or other means of coercion against group autonomy and interdependence is indeed a tricky feat. For example, Moore and Mara examine an "argumentation protocol … designed to facilitate knowledge construction", an arguably collaborative process that they demonstrate and exemplify in practice discussion. Yet, they conclude, "the argumentation protocol, as we implemented it, may have negatively affected students' quantity and quality of participation" (2005, p. 207).

If more technological structures fail to consistently foster learner collaboration, perhaps creating cultures of collaborative development can. Many teacher educators, in fact, advocate starting by teaching teachers (and administrators) to collaborate in online projects by having them participate in online projects themselves (Crichton & LaBonte, 2003; Taylor, 2005).

Similarly, educators who want to get learners to use weblogs and wikis effectively need to use the same tools effectively themselves. (See Chapter 25, Tools for Online Engagement and Communication.) At this juncture, however, we shall give tools a reprieve, and next take a closer look at assessment schemes, to see whether they are likely to promote collaboration.

ASSESSMENT SCHEMES FOR ADULT LEARNERS

> "What is assessed in a course or a program is what is valued; what is valued becomes the focus of activity. The link to learning is direct. Instructors signal what knowledge skills and behaviors they believe are most important by assessing them. Students quickly respond by focusing their learning accordingly". (Swan, Shen & Hiltz, 2006, p. 45)

With respect to adult learners in particular, Huang offers six principles to guide both instructional designs and teaching practices:

(1) *Authenticity*: Allowing learner participation in course design can help avoid pre-authentication and can ensure that courses are meaningful and authentic with respect to adults' needs, working lives, and experiences.
(2) *Learner-centeredness*: In order to develop "ownership of the learning process by learners", the learners themselves need to become invested in the process from the planning stage onward.
(3) *Facilitation*: Although provisions for autonomy are essential for adult learners in a constructivist model, designers and instructors still need to facilitate and support [both] autonomous and collaborative learner development.
(4) *Interaction*: Interactions with tools, peers, materials, and instructors can serve as motivation for adult learners, and also as springboards for critical reflection.
(5) *Collaboration*: Collaborative endeavours that involve sharing, reflection, negotiation, and synthesis of knowledge are conducive to adult learning.
(6) *Critical thinking*: Adult learners need to use "higher order thinking skills … to determine the authenticity and quality of information", processes, and tools at their disposal. (Huang, 2002, pp. 32–34)

To those principles let us add that adults ought to evaluate the "discussion-oriented, authentic, project-based, inquiry-focused, and collaborative" learning processes in which they participate (Huang, 2002, p. 35), in order to determine how effective those processes are in helping themselves to achieve their own educational, social, and future goals.

However, it appears to be rather rare for collaborative ideals to carry over into assessment practices. For example, Roberts points out that, even in so-called radical models of collaboration, assessment is often the last holdover from the new paradigm, and he speaks of "a fairly traditional model of assessment, since the grade awarded is based on the standard paradigm of attempting to assess the individual's own efforts, even within the context of an online collaborative learning environment" (2005b, p. 8).

While Haavind (2006) construes scaffolding and evaluation of participation as fundamental to collaborative learning endeavours, learners' expectations and educators' proclivities may disincline towards collaborative evaluation processes. For example, learners may respond quickly to external rewards, marks, or grades that educators offer as incentives for collective learning behaviours. However, where incentives or coercion come into play, they may induce cooperation rather than collaboration, which ultimately depends upon learners' self-motivation and mutual responsibility for joint learning outcomes.

At their best, technological tools may enable us to assess learning processes and outcomes that we have been unable to assess before, provide more immediate diagnoses and feedback on difficulties learners encounter, and even adapt content presentation accordingly. However, there are still problems of skills that elude technological assessments, including unresolved validity issues, technical glitches, or system failures, as well as formative and social shortcomings to such assessments (Carnegie Mellon, 2002; Advantages and disadvantages of using advanced technology for assessment). Even in what you could call cutting-edge introductions to uses of social software and activities for collaborative learning purposes (Cameron & Anderson, 2006), assessment criteria range from "none" for orientation to tools and environment, to familiar and formulaic measures, generally based on quality and quantity of written products or online postings.

In fields that are specifically concerned with such interaction, such as education, there is less pressure to have such collaborative processes produce concrete results, with processes rather than products being the keys. Additionally, the inability of decision makers in other fields to appropriately assign credit in a way that reflects the collaborative process makes collaboration a much more difficult affair to promote. An episode of the beloved US television series *M*A*S*H* serves to illustrate this problem. When Hawkeye develops a new surgical technique that is worthy of publication, the fact that this technique arose only because of the intense collaborative environment in which he worked led the other doctors to be envious of the acknowledgment he received for his paper. The solution, that of having the paper published with the MASH 4077th unit as the author, while a Hollywood resolution that fits the time constraints of series television suggests that collaborative work can encourage examination of values and ideas. So exposing students in other fields, such as the sciences, to collaborative learning not only creates opportunities to advance different forms of problem-solving, but also enables the examination of received wisdom.

Often assessment seems contrived and controlled by instructors rather than learners, for summative rather than formative purposes. Modes of assessment that Graham and Misanchuk observed cover the gamut from individual to peer group and from process to product. However, in none of the examples that they mention do they refer to collaboration in the evaluation process (2004, p. 194); it appears as if the synergy of social cognition gets lost in the shuffle of assessment technologies. So for the future, Dede envisions arguably more suitable "peer-developed and peer-rated forms of assessment" (2005, Implications for Higher Education's Strategic Investments).

> "Our assessment practices have to keep in step with our understanding of human cognition, and new technologies are one set of tools that can help us to meet this challenge." (Carnegie Mellon, 2002)

A broader view: educational collaboration in context

Many of the various problems and issues that arise in collaborative models of learning and teaching have comparatively straightforward solutions, such as modifying tool choices and experimenting with ways of forming groups. In the background, however, always lurk more general issues concerned with educational models and enculturation to more collaborative modes of learning. We address such issues briefly in this section.

STAKEHOLDERS AND COMMITMENTS

Administrators', educators', and learners' stakes in, and commitments to, distance education and collaborative learning are critical. Not long ago, a large proportion of administrators may have had little or no experience with, or knowledge of, learning or teaching online; and thus they may have failed to grasp the importance of logistical and technical support both for educators and learners. Administrators may still overestimate the number of students who can comfortably be accommodated in courses, and may grossly underestimate demands on libraries and technical support (Johnson, 2003, para. 2).

Educators, in turn, may underestimate necessary investments, and may jump into technology-based teaching "without fully realizing the high degree of individual student involvement that will be required, or the radical shift in the role of the faculty", perhaps because many of their peers "have already made that leap of faith into a new modality, and are approaching it with vigor and enthusiasm" (Johnson, 2003, para. 3). Developing close relationships with technical support personnel (Noakes, 2003) suits only those whose institutions have such personnel. Thus, educators contemplating adoption or adaptation of technology to foster learner collaboration should not only scan their institutional environments for available support or relief mechanisms (Bates, 2000, Ch. 2: Leadership, Vision, and Planning), but also realistically assess the time commitments that both they and learners are willing to make.

Time commitments and constraints are of critical importance to online learners in particular, for, as Johnson reminds us, "Learners usually come to online courses due to limits in time or geography, not necessarily because they want to be heard as individuals or work in teams" (2003, para. 4). Likewise, Guribye, Andreassen, and Wasson point out that "Collaborative learning can impose a severe workload on the collaborating actors" (2003, p. 385). In response, Vanides argues that, though "popular expectations about e-learning" may be problematic, particularly with respect to ease and convenience, "deep learning takes deep commitment" from both educators and learners. So he recommends not making group assignments without the will to "invest the effort to make it work … [by] setting clear expectations, rules of engagement, spending time facilitating and helping students with social negotiation, and rewarding teamwork" (Vanides, 2003).

ENCULTURATION

When we use technology to develop learning environments, we "code in our cultural biases, our beliefs, and values" (White, 2006, para. 3). So we need to consider not only whether the institutional and organizational cultures in which we work reflect practices and values of collaboration, but also whether our own habits of collaboration are reflected in the collaborative environments that we are striving to create and in the collaborative processes that we aim to foster and facilitate. As Daradoumis and Xhafa put it: "A culture of collaboration must be based on relationships characterized by trust, motivation, encouragement, mutual support, and openness" (2005, p. 223).

Peer-facilitated enculturation (Olt, Gack, & Cole, 1993), in discussion-based communities for example, may derive from legitimate peripheral participation, or social apprenticeship in collaborative learning communities where contributing, writing, responding, and reflecting are behaviours that accommodating peers scaffold (step-by-step, tier-by-tier), in order to give other learners, and to encourage co-readership and peer responses by not making exceedingly lengthy or multifaceted contributions (Bender, 2003, p. 9). Nevertheless, Bender recognizes the difficulty of instructors providing necessary scaffolding for entire classes, "not only because of class size, but because of the diversity of students" (p. 9). So, in learning communities where diversity is taken as a virtue, it may be necessary for the learners themselves to push the envelope of sociality in order to make their online learning environments more personable and conducive to sustainable and satisfying collaborative learning experiences.

However, how likely is it that run-of-the-mill learners are capable of, or willing to, nurture their peers, if their instructors and communities fail to manifest nurturing and apprenticeship practices at large? Online educators can assess their own tendencies to nurture learners, but perhaps creating a culture of collaboration requires broader, deeper, and longer-term commitments than many educators and learners are willing to make. As we mentioned earlier in discussion in this chapter of assessment schemes for adult learners, in learning contexts that are notably competitive, or where any culture of collaboration runs too shallow to fathom, perhaps offering incentives to induce cooperative learner behaviours would be a small step forward.

It may be necessary to start with teacher training and the ways in which teachers interact with each other in their professional lives, because, as Murphey and Asaoka (2005) argue, fractal models of teacher collaboration predispose student collaboration. That is, if educators collaborate and reflect with one another, as well as with the learners that they profess to educate, the learners themselves stand to benefit from both role models and apprenticeship.

Furthermore, if the notion of collaboration seems intriguing, then offering incentives as part of the process by incorporating it into grading and marking is something to try. The recent trend of reality-competition television shows such as *Top Chef* and *Top Design* often have the competitors work in teams, with one person from the losing team subject to elimination. While this is too Darwinian for our own classrooms, it is a useful exercise to have students realize that their learning does not take place in a vacuum but depends on the contributions of other peers.

Pratt and Collins offer an inventory of educator perspectives, one of which, apprenticeship, seems perfectly harmonious with efforts to enculturate students to collaborative endeavours: "Effective teaching is a process of enculturating students into a set of social norms and ways of working" (Pratt and Collins, n.d.). The increasing prominence of collaborative endeavours in professional training and development contexts may do much to bring us nearer to the bright future for education that we envisage.

The future of collaborative learning

We have little doubt that developments in technologies and in both our understandings of, and practical measures for, building online communities will figure prominently in collaborative learning futures. Cameron and Anderson (2006), for example, present a suite of preparatory activities for distance learners to familiarize them with technology—social software in particular—and to introduce them to a distributed learner community. Learners' deliberate, preliminary accomplishment of many of those technological tasks may satisfy Roberts' (2005a) call for preparatory work to make sure that students are already computer-savvy collaborators before they begin collaborative online coursework.

Visionary arguments suggest that innovation in collective learning calls for diverse communities comprising members with ranges of expertise, congruent goals, meta-cognitive (learning to learn) foci, and various means of communication to satisfy their own needs. Moreover, visionaries suggest that participation in diverse, distributed learning communities will "infuse education throughout students' lives, orchestrating the contributions of many knowledge sources embedded in real-world settings outside of schooling" (Dede, 2005, Neomillennial Learning Styles Based on Mediated Immersion).

For the future of collaboration, Dede hopes that current means of collaboration that are "dependent on shared physical presence or cumbersome virtual mechanisms" will be replaced with elegant and possibly more economical solutions in which "middleware, interoperability, open content, and open source enable seamless information sharing, collaborative virtual manipulation of tools and media, shared authoring and design, [and] collective critiquing" (Dede, 2005, Implications for Higher Education's Strategic Investments).

So perhaps whatever decisions we make as educators with regard to collaboration should be as remote as possible from tool dependent and as comprehensive as possible of what is both available and of value to learners over ever-broadening and diversifying educational networks. Chapter 26, Techno Expression, comprises broad visions of such networked learning.

Stories, strategies, tools, and tactics to come

The next section of this chapter retells stories of online collaboration to underscore impacts that educators' technological choices and teaching strategies can have on learners, to reflect upon learner-centred outcomes, and to suss out lessons to learn from experience—if not models to guide us. After reading those stories, readers may like to explore tools and tactics of learner engagement catalogued in Chapter 25, Tools for Online Engagement and Communication.

Learners' stories of online collaboration

In this section are three stories from learners about online collaboration in university undergraduate and postgraduate courses. All three stories derive from a SCoPE seminar on collaboration (Beaufait, 2006). Narrators retell their stories for this collection and post-hoc respondents reflect on each.

These three stories bridge a millennium, span a decade of online education, and perhaps show it at or near its best. Sylvia's story is a recollection of project-based learning over 10 years ago in an undergraduate course at university. Beyond the Mines of Bhoria is a recollection of a post-graduate certificate course about three years ago. Bonnie's story relates experience in problem-solving and project-based learning during an online graduate course in 2005.

SYLVIA'S STORY

One of my first online courses was also my first exposure to successful learner collaboration in a university-level course. The instructor used a "jigsaw" model to organize a research and learning management software design project as follows:

- *Phase I (4 weeks) was a general orientation to issues and an introduction to the software product we would be evaluating.*
- *Phase II (5 weeks) involved group investigation into the design of technology.*
- *Phase III (4 weeks) involved a team design project incorporating the interdisciplinary perspectives researched during Phase II.*

During Phase 1 we engaged in a debate activity that gave us an opportunity to become familiar with the beta software, and also to sink our teeth into some design issues. For Phase II we randomly formed five groups, each with the responsibility of researching and developing expertise in one of the assigned design perspectives and to prepare a summary of findings.

(1) Human-computer interactions design
(2) Educational software design
(3) Group communication and computer conferencing design
(4) Collaboration and groupware design
(5) Hypermedia systems and tools design

With such a short time frame to complete this phase, it was essential that the instructor scaffold our work by providing the main topic areas, a selection of core readings, and a recommended format for organizing the report and presenting our work at the end of Phase II.

We were then divided randomly into five new groups using the Jigsaw model. Each new design group consisted of an "expert" from each of the former research groups. Using this model, each learner had something unique to contribute to the group based on their earlier research. The final outcome was a group design plan for refining the learning management system software we were using in the course.

We came back together as a whole class to share and discuss our final design projects with developers from the software company. Functioning as software design teams, we were required to creatively and succinctly articulate our designs and theoretical support for our decisions and defend our work through open questioning by other class members and visitors.

One aspect that made this a powerful, collaborative learning experience was the situated course design. We were assessing the effectiveness of the learning management software as a communication medium for accomplishing our own collaborative work. In addition to drawing on individual areas of design expertise, we reflected on the experience of using the virtual space to accomplish our design tasks. As such, it was an authentic task of using educational technologies in an educational setting.

Scheduled team meetings with the instructor provided a focal point, requiring us to articulate our progress as a group. The structure of these meetings modelled authentic interdisciplinary design team environments. Also, throughout the project we were encouraged to use the learning management system as much as possible. This served two purposes:

(1) We experienced first-hand the affordances and limitations of the communication technology under review, adding to the authentic nature of the task.
(2) The process of group work was made explicit to assist class members in reflecting on their educational experiences in using the technology. In other words, we were able to use examples from immediate experiences to illustrate shortcomings of the software under review.

Another essential component was that we were clear of what we were working towards. There was a great deal of flexibility in how we chose to go about our work, but we could appreciate how each phase informed the next. We became aware of our own background knowledge, learning needs, and interests. The sequence of full class to small groups to full class to small groups to full class allowed for sharing, checking of our work and progress, then we went back to the smaller groups to focus on the next phase.

I remember what really struck me at the time was how important the instructor's role was in guiding the process, how supportive she was, but also how little we saw of her throughout the course! The jigsaw collaborative model was a perfect fit for a research and design project. (Sylvia Currie, personal correspondence, June 21, 2006)

A reflection on Sylvia's story

Sylvia's story highlights some important points about the use of technology. First, note Sylvia's point about the instructor providing a scaffold for student learning, which she suggests is due to the short time frame. However, it is important to underline that the time frame is short not only because of the demands of the class, but because the class was conducted online.

We see the instructor providing focal points in time ("scheduled team meetings") in order to keep students working towards a goal. It is at this point that we see two potential problems. The first is what happens when an unmotivated student or students participate. The second related point is how we demonstrate that the teacher is active. Sylvia is perceptive enough to recognize the teacher's participation through the framework that the teacher set up, but other students (and administrators) may not be as perceptive.

Another important point about the use of technology can be seen in Sylvia's observation that the task the students were set is authentic. In this sense, the technology is not used for recreating the classroom (a common problem with many schemes that are simply content delivery) but for setting up a task that replicates something that might or will be done in the real world.

The final point is that the technology, rather than making each student a clone with similar knowledge and experiences, calls on students to access their individual knowledge and interests and bring these to the table in order to inform other team members. Thus, teachers wanting to use technology successfully probably have to have greater awareness of the strengths and weaknesses of students that they are teaching with technology than without, and this stands the commonly expressed fear of technology replacing people with robots on its head.

Another reflection on Sylvia's story

Sylvia is very clear on what she got from the course and why, and there is very little that I can add to what she said. I shall just mention the points that remain foremost in my mind as a teacher immediately after reading the story.

The first is the important role of teachers' judgment on key aspects of course design. In an ideal world, some of us might wish to leave more decisions to the students, such as exactly what groups need to be formed, but the teacher in Sylvia's story had evidently decided that he or she was fully justified in prescribing certain steps in order to get to the desired endpoint on time.

The second is the nature of the endpoint that was chosen in this case. Having a meeting with representatives of the software company scheduled, knowing that guests would be invited, and therefore knowing that being able to articulate one's thoughts and design proposals beyond the confines of the class was expected, was clearly a very focusing and motivating factor for students. There are clearly some risks in this strategy, because an unsuccessful group would have been enough to create a somewhat embarrassing situation in front of a wide audience, and, more importantly, it might have been difficult to point to any clear outcomes of the course, since everything was framed in the context of the final goal. This points again to the importance of the teacher's judgment.

In addition to the teacher's judgment, another thing that is clearly required of the teacher is skill in guiding the process, as well as considerable time spent planning the course. Sylvia doesn't make it clear what level of student this course was for, but at least it seems likely that it wasn't a freshman course. We expect that for a freshman course one would be a little more modest in one's goals. This would be even more true of pre-tertiary education.

Additional comments from Sylvia

Years later while reflecting on this experience I realize how it influenced my ideas about assessment of learning. There was never an expectation that certain content "be covered" or that all students should be leaving the course with the same new knowledge. The nature of true collaborative work is that there is considerable variability in what is learned. It is important to take advantage of the diversity of [learners'] skills and knowledge and appreciate how each learner contributes to the advancement of the group. Assessment strategies that are based on the assumption that everyone is learning the same thing obviously don't fit. Also grading practices that look at individual work, rather than group processes and accomplishments are difficult to implement. (Sylvia Currie, personal correspondence, August 18, 2006)

ANOTHER STORY: BEYOND THE MINES OF BHORIA

It was a constructivist-collaborative course-build. The instructional plan combined three sections of the same course. Students could introduce themselves by producing courseware supported Web pages. There was one big forum for introducing yourself, get-ta-know-ya, hi-how-have-you-been, what're-ya-up-to messages. Though a peek at an instructor's view might reveal literally hundreds of unread student messages, they constituted a massive tableau from and through which students could establish identities, draw together, and form obligatory groups for ensuing project work.

Alongside ran a set of course readings, topic-specific discussions, and jigsaw analyses of core concepts. Focused and stimulating discussions with guest contributors prominent in the field rounded out the suite of interactivity.

A course schedule, plus group mates' diverse experiences, practical needs, and individual interests drove group work on to a plan, a written proposal, and an elaborate framework for a multi-faceted online instructional program. Except to say that our group of four had compatible *personalities, despite diverse socio-cultural backgrounds, let me go into no further details on that point here.*

As a student, not only did I realize that the course instructors had collaborated on building and updating the course, it also was evident that they collaborated among themselves as well as with students on group formation. Being in one section didn't restrict student-to-student interactions with those in another. In fact, all my group mates were from other sections, and another instructor supervised and supported us in our group activities.

It was, all in all, a warm, fuzzy, collaborative production zone, until it was time for peer groupwork assessment. Final group reviews and tweaking of our jointly planned and substantiated product had gone like clockwork: Incremental file-naming, one-author-at-a-time editing, annotation protocols, change-tracking, precise references, and peer-to-peer suggestions got approved, bettered, and confirmed—pass after pass, following the sun around the globe. One by one, we signed off on what was left, proud to have done the best we could under the circumstances, and went to bed …

The final group assignment was done, and collaboration was over. Our next task was to assess ourselves, and each of our group mates, individually, using an evaluation framework that course developers and instructors had prepared in advance. There was neither negotiation of criteria, nor feedback on results. We submitted individual forms to our individual instructors, and that was supposed to be that. However, one student in our group of four sent complimentary copies to everyone in the group. That assessment closed with an open question: "Why isn't this assessment collaborative?" but no discussion ensued.

A reflection on Beyond the Mines

This story is a useful counterpoint to other stories of great successes with online project-based work. While this too sounds successful, one is left with a feeling of great possibilities left untouched. Of course, this relates to the last area where teachers retain power, which is in assessment. Teachers, at the end of the day, have to turn in rolls with grades, and doing so is an act of responsibility impinging on our efforts to expand our classroom, even as technology stretches it beyond recognition.

All teachers treasure moments when a student returns to thank a teacher for some lesson that was put to use, and I have often, when doing something that stems from a teacher's guidance, wondered what he or she would think. As the technology puts students together to teach each other, it suggests that we are going to have to create channels to keep teachers in touch with their students.

Another reflection on Beyond the Mines

Even in a purportedly "radical model" of asynchronous, computer-supported collaborative learning, as we pointed out in the section on Assessment Schemes above, Roberts finds that educators often continue to base course grades on learners' individual efforts (2005, p. 8). We see such limitations even in Beyond the Mines of Bhoria.

On a brighter note, in a synchronous computer-mediated collaboration (chat) study, yet still in line with Haavind's (2006) and Roberts' (2005) calls for evaluation protocols, Paulus suggests that sterling peer evaluations can indicate equality of participation, even though learners' reflections may reveal more cooperative and less collaborative interaction strategies such as division of labour. For example, follow-up on the small chat group that Paulus studied revealed that learners "chose to cooperate through individual contribution to the task, rather than collaborate through sustained dialogue about the concepts to be learned" (Paulus, 2005, p. 119). I think the Mines story shows what educators can do more to foster and facilitate formative peer evaluations.

Confessions of a former post-graduate mine-worker

It has been years since my first, and hopefully last, adult educational experiences involving largely pre-constructed technological learning environments, built utilizing what instructional designers called modules and shells. On one hand, those learning experiences enabled simultaneous reflection on two leading ed-tech platforms at the time: Blackboard (Bb, hence Bhoria) and WebCT; and rounded out instructional experience using Moodle, an alternative, open-source platform. They also revealed a host of variables in quality of instruction and extent (or limitations) of cooperation and collaboration in online learning environments. On the other, although I continue to adopt and adapt computer-mediated communication strategies whenever they seem conducive to enhancing blended learning opportunities, my stomach still churns in memory of canned instruction often dependent upon educational decisions of remote designers and disengaged instructors. Nevertheless, hope revives as I remember the considerate and engaging peers and educators among whom collaboration was possible despite instructional designs, technological shortcomings, and other staff and student commitments. (anonymous, September 14, 2007)

BONNIE'S STORY

In an online graduate class in New Media last summer, I was assigned to a group of four, and we were to produce a learning module both discussing a particular issue of New Media as well as a New Media artifact. The instructors of *the class grouped us according to our experience, expertise, and interests. We were a mixed group of high school teachers and adult educators with differing technical expertise, from almost zero to highly sophisticated. We also had a very strong personality in the group, someone who could be quite opinionated but also very, very funny.*

In my mind thinking about this project, I divide the group's work over the six weeks into two distinct periods: There were the first two weeks when we discussed at length about the project and how we would work on it, and the last four weeks when we worked on the project itself. The group functioned differently at the two different stages of the task: talking about the work versus working on the work itself.

For the first period we used an asynchronous forum and tried to use a wiki. Because the wiki added another channel of communication, we did not use it so much and focused our discussion in the forum space. However, the discussion dragged on and on. No conclusions or decisions seemed imminent. It seemed we were all reluctant to take charge and make a decision. Perhaps it was because none of us wanted to counter the strong personality, who seemed to have quite strong attachments to certain ideas.

Finally we met in a synchronous chat via WebCT's integrated chat function and managed to make all the very important decisions quite rapidly. Ironically, the strong personality was very amenable to the ideas of others and very happy to accept other ways of doing things.

Once we began work on the project in the second period, our communication with each other became very frequent and very effective, using both asynchronous and synchronous channels. Once we actually had something tangible to work on and to communicate about, we began to really gel as a group, so much that our synchronous chats often digressed wildly into other topics.

We also had various open forums for discussing different aspects of the project, emailed one another, and used wikis as repositories for ongoing text writing. We were now a multi-channel group and it did not seem onerous because we had so much to discuss. Once we reached the end of the project, I had very good feelings about our group and our project was fabulous.

In retrospect, if we had had defined roles at the beginning (or role interdependence), for example a project manager, a web designer, a subject matter expert, etc., our decision-making at the beginning might have been smoother. I think that we were four very socially and culturally different people and we encountered problems with just 'discussing with our group'. If that had been the end of the group's purpose, I think we not would have felt our group had been very successful.

However, once we began work on the project itself, we attained high positive interdependence in terms of goals and sub-tasks because each of us was responsible for a portion that others depended on. Having the tangible product itself seemed to grease the flow of communication. Because we had to create some thing, working on a very real, very tangible artifact facilitated our communication, helped us, and quite frankly, forced us to overcome our difficulties, all without our being conscious of it.

Our goal was completion of the product, not just the communication itself. Because of that I think that the communication issues became just another problem to solve rather than turning into a potential drama. I think that one of the best reasons for product/project-based collaborative learning is that in order to be successful, groups put into practice all the important aspects of cooperation without having to be fully conscious of it, or being didactically taught it. (Bonnie Johnston, personal correspondence, May 26, 2006)

A reflection on Bonnie's story

Bonnie's story raises an interesting problem. What if her group had not been able to meet synchronously? Would they have been able to sort out the problems? Or would they have given up and been convinced that the technology itself was the source of the problems? Bonnie's remedy, of having assigned roles for members of the team, while solving her team's problem, might have been unnecessarily restrictive for another team or could have pushed a non-participating or non-performing member of the team off to the side.

Bonnie is correct that one of the best reasons for project-based learning is that it is based on aspects of cooperation of which students may not be fully conscious. However, this also suggests that teachers must be fully versed on all aspects of project-based learning in order to troubleshoot learning processes. Complicating this is the fact that classrooms can become cross-cultural. So what happens when there is disagreement about what actually is cooperation?

Another reflection on Bonnie's story

Bonnie's story reinforces my thinking that teaching about collaboration should be kept to a minimum, except in very specific circumstances. As she says, how to use tools is a problem of sorts, but it needn't be such a major one, and if the motivation (usually creating some kind of product) exists, there is no reason why problems of this sort can't be solved.

The fact that Bonnie's group used a range of tools suggests first that synchronous and asynchronous tools both have important roles to play, with the former perhaps being crucial in groups where delivery of a product is very time-sensitive. This story may also indicate support for the idea that different asynchronous tools work in different ways and are difficult to mold to non-archetypal uses. But where that difficulty leads us is a matter of interpretation.

One interpretation would go something along these lines: A forum is necessary to discuss specific issues in both threaded and archived form; email is important for very time-sensitive discussion-type communications (and perhaps where two members have an interpersonal problem with another member); a wiki is necessary for the actual creation of the product. Another interpretation is that, because the participants appear not to have been given orientation in the use of tools, they muddled through somehow, without any tool-related drama, but without really mastering any of the tools and possibly suffering inefficiencies, and by extension also possibly turning in a product that was not quite as good as it could have been.

Such orientation itself is problematic, first because there is no clear consensus on how to use each tool, and second because it might reduce the possibilities for group-generated discoveries regarding the tools. However, the group might have benefited from instruction about the possibility of starting discussion in the wiki itself. This could avoid the problem of the wiki being seen as redundant in the first phase and, consequently, members being less fluent in its use when the second phase started. It might also have alleviated the relative sterility Bonnie experienced in "just discussing with our group", because a wiki could facilitate the later incorporation of things initially offered as pure opinions, but actually included as seeds of a product.

One obvious question is whether they needed, or benefited from, multiple wikis and forums. Another tool-related question regards the use of really simple syndication (RSS), which can provide convenient regular updates of recent messages and changes: I wonder whether it might have been possible to reduce the number of channels, with possible efficiency gains, if RSS had been incorporated.

After these negative-sounding comments on tools, it may be appropriate here to reiterate: As Bonnie said, the members of the group were able to negotiate problems as they arose without any catastrophic consequences, and had the opportunity to experience first-hand a range of tools, while getting a sense for what works and what doesn't work for each one.

Another point in Bonnie's account is that it is very difficult to work together in a meaningful way without a clear goal. In a formal educational context, that usually has to be a goal imposed by, or negotiated under the guidance of, a teacher. The first two weeks might have worked better if they had been turned into a task to get a broad grasp of a body of knowledge, while getting to know the other group members and negotiating how to approach the topic and tasks to follow. Thus there would have been something very substantive to discuss in the forum, and the discussion about process could occur in the background, if necessary. Even more radically, the group could have been tasked with reading as much as they could manage of a large body of knowledge and summarizing it on the wiki that they would subsequently use for actually doing the project.

Finally, although some members are described as being at "almost zero" in terms of technical expertise, in other respects, they are mature and sophisticated compared to the students that most teachers will meet in most contexts. Thus, any kind of problem mentioned by such students has the potential to be many times magnified in other contexts. This reinforces the point made above that goals need to be clarified, and tasks not clearly linked to those goals have a high risk of failure. Therefore, teachers may need to come up with various ways of making explicit these linkages, perhaps by assigning tasks like reading a body of literature.

Additional comments from Bonnie

Reflecting further on this collaborative experience, I keep coming back to the group's interpersonal dynamic. The first phase of completing the project was seemingly spent worrying about how we would work and doing busy work on the project itself. However, I think we were also doing the more important work of feeling our way with one another, learning how each of us interacts, and exploring which tools worked best for our unique mix of characters. While on the surface the initial phase felt fruitless, it was in fact creating the bedrock of how our group would work together. (Bonnie Johnston, personal correspondence, August 29, 2006)

WHAT THESE LEARNERS' STORIES REPRESENT

You could argue that those three stories are cream of the cream—not at all representative of learners that you might expect or hope to nurture or teach in ways of collaboration. You could accurately describe the learners whose stories we have shared as generally advanced, mature, motivated, and technologically sophisticated learners who continue to work, often collaboratively, with educational technology. However, with respect to online learner collaboration, what such learners are able to engage in, succeed at, and recollect, with so much insight on learners' perspectives, still serves as a framework of inspiration for what we might expect of current and future online learners.

It is a cliché to invoke the notion of a wave of the future. However, as technological advances occur, we find ourselves with more and varied opportunities to interact with people unconstrained by time and space. To take full advantage of these advances, collaboration, in some form, is a necessity. Since a field like education potentially has the luxury of experimenting with collaboration for collaboration's sake, by examining what collaboration may look like in ideal circumstances with ample preparation time and little or no pressure to produce end-products, we feel that a close examination of research in that field suggests possibilities for other professionals to take up in their own fields and teaching endeavours.

Chapter summary

> "Great discoveries and improvements invariably involve the cooperation of many minds. I may be given credit for having blazed the trail but when I look at the subsequent developments I feel the credit is due to others rather than to myself." (Alexander Graham Bell)

> "Creativity arises out of the tension between spontaneity and limitations, the latter (like the river banks) forcing the spontaneity into the various forms which are essential to the work of art or poem." (Rollo May, 1975, p. 115)

We have presented background on circumstances and factors that ideal collaborative learning in an online environment might require, and we have indicated potential pitfalls of such collaboration. The first pitfall is definitional, and we follow researchers' attempts to draw distinctions between what is cooperative and what is collaborative.

Understanding that collaboration represents a deeper and richer notion than cooperation, we examined how diversity in the classroom naturally lends itself to collaborative learning, and we then looked at the roles of teachers, moving on to focus on the core of such learning, which is the group. This served as background for a variety of issues such as tools, assessment, and a range of other concerns that may influence the success or failure of collaborative endeavours. It is noteworthy that the learners' stories highlight assessment as an area where advances in collaborative learning next need to take place. Perhaps this should not be surprising, given that learners' primary feedback from a course is assessment.

Although rote memorization may once have represented the be-all and end-all of learning, we have arrived at a more sophisticated notion that what needs to be evaluated is how learners use the knowledge they acquire. However, there is no consensus on how such evaluation should operate. In this sense, collaboration, as the Rollo May quote (above) suggests, can be regarded as a way not only to bring new material to the learner, but also to foster collaborative endeavours that may help us to reach a consensus on evaluation, a consensus that may provide seeds for ubiquitous, spontaneous, continuous, and collaborative learning.

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Glossary

Collaborative learning. Learning techniques that emphasize student-to-student interaction in the learning process (McInnerney and Roberts, 2004).

Cooperative learning. Learning techniques where students are required to work in small groups, usually under the guidance of the instructor (McInnerney and Roberts, 2004).

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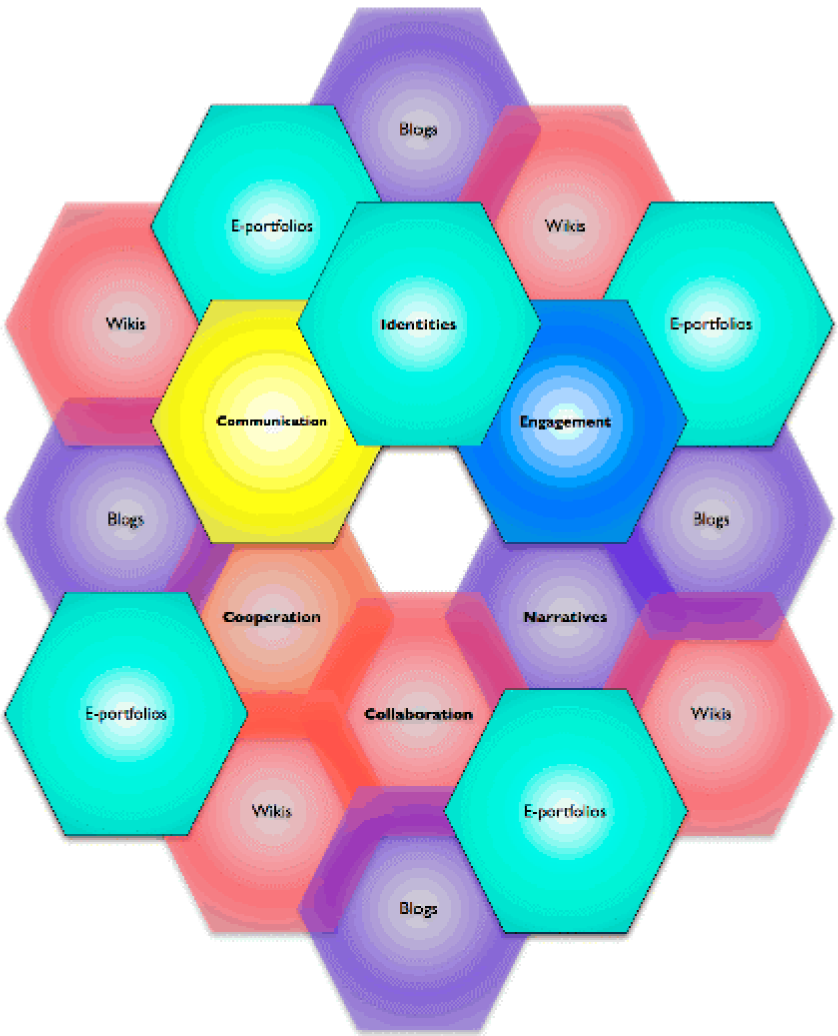
29
Identity in Online Education

Joseph Tomei, Paul A. Beaufait, and Richard S. Lavin[70]



[70] With contributions from Tod Anderson, Lynn Kirkland Harvey, Karen Barnstable, Kathryn Chang Barker

Learning outcomes

After completing this chapter, you should be able to:

- Understand the notion of learners' identities and how it underpins all online communication.
- Be aware of the issues related to online identities.
- Know how educators can support learners as they establish their identities in the context of online education.

Introduction

> "If I could wake up in a different place, at a different time, could I wake up as a different person?"
> – Chuck Palahniuk (1999, p. 33)

The notion that we are who we are is not necessarily true as we move into the online world. Given that educators have a measure of control over, and vested interests in, how they represent themselves online, Lynn Kirkland Harvey's wide-ranging discussion underlines the fact that learners' online identities, over which educators exert quite limited control, deserve special consideration. The importance of identity-related issues looms even larger when we embrace the notion that identity is the base from which learners' engagement with content, as well as communication with others, begins.

In the traditional classroom, a student's identity is almost completely bound up—physically, kinesthetically, and linguistically—with the individual as he or she enters the classroom. In the online classroom, learners enter with only their words and perhaps selected images and create identities from those. Students may not be conscious of the myriad choices available to them, so it is up to teachers to help learners establish their identities. This is true of adult and higher education students, and even more so of younger students, whose identities are much more fluid.

As a window into what parameters identity may take, we turn to Tod Anderson's summary of secondary student participation in online learning across British Columbia. Anderson provides a snapshot for technological understanding from a locale that might represent a best case scenario—or at least a fairly advanced one—in which he notes that the technologies in use have, to a large extent, been adopted from higher education, and that secondary schools face many of the same issues that tertiary and adult educators have been facing for several years.

It is worth bearing in mind that as the technologies that Anderson discusses trickle down through the educational system into younger people's hands, his snapshot is potentially a portrait of the future for elementary educators. This underscores the necessity for considering learners' identities from the very beginning of online work, rather than just as a concern of secondary and tertiary students.

As students establish their identities, they have to negotiate and engage with other students, and in online courses channels for negotiation and engagement are necessarily different from traditional classrooms. The power of online classrooms does not simply arise out of their time- and space-shifting potentials, but also from the potential of diverse sets of many-to-many relationships as students engage with each other. Many of the lessons we aim to teach students are not simply to do with mastering course content, but also involve understandings of issues involved in working with others and collaborating towards shared goals; online environments can help us realize these aims.

Finally, we examine identities through the lens of e-portfolios, which can be viewed as snapshots of learner identity at particular moments in time, created either to facilitate reflection or to allow evaluation by a teacher or consideration by an employer.

Online learners' identities

by Lynn Kirkland Harvey

> "If you establish an identity, you build a monster—and that's right, you've got to live with it. Of course, you can enjoy it too". – George Shearing (Tomkins, 1976)

Current discussions about online learning reveal that learners may have a sense of disorientation, isolation, and disembodiment when they first begin an online course. Research also indicates that a sense of anonymity can create a safe place for learner discourse (Blake, 2000; Burbules, 2002; Smith, Ferguson & Caris, 2002). Issues of age, gender, race, socio-economic background, and culture no longer determine how one's comments will be received. Shy learners find their voices and experience the thrill of being validated by their classmates in public forums. Learners feel more inclined to challenge instructors and, as a result, become more empowered in their learning. The role of a teacher shifts from lecturer to motivator (Easton, 2003; Shale, 2003; Thorpe, 2001; Walker, 2003).

Nevertheless, attrition rates in online courses are significantly high, and studies suggest it is because students are not motivated (Easton, 2003; Hodges, 2004). It is obvious that this presents a contradiction: How can we motivate learners if we are uncertain who they are and what they need?

If we ask learners to provide personal information to help us help them learn, will that undermine the value of their anonymity?

What role does the learners' sense of anonymity and a perceived alienation from a community in the virtual classroom play in their success in online learning?

ANONYMITY

Being anonymous is how most Internet users think of themselves and others when using the Internet for collecting information, viewing websites, and playing online games. However, is being anonymous the best way to describe the online learning experience? At its most basic, anonymity refers to not being recognized or known. But in an online classroom, as teachers, we know who the students are by name, and eventually by their contributions and grades.

Anonymity in the online classroom may be better described as having some level of disidentification. Hodges defines disidentification as "a split between a person's activities and their relations with participation, a rupture between what a person is actually doing, and how a person finds themselves located in the 'community'" (as cited in Walker, 2003, p. 57). Learners perceive that, even with identifying names, they are still physically invisible and relatively unknown in the virtual classroom. This sense of anonymity in online learning has been found to have a positive influence on the learning experience (Blake, 2000; Burbules, 2002; Smith et al., 2002). Eliminating physical or auditory indicators of gender, age, ethnicity, disability, and physical attractiveness can influence interactions by reducing learner biases and preconceptions and increasing the focus on content.

In addition, learners can become empowered to determine the degree of their own self-disclosure. They can decide how much or how little to share about their personal selves, and they can construct the level of anonymity that best meets their own social and learning needs.

Anonymity also promotes more equality between students and instructors, divesting the teachers of some authority (Burbules, 2002; Easton, 2003; Shale, 2003; Singh & Pan, 2004; Smith et al., 2002; Walker, 2003). Students feel more confident in challenging their instructors and debating ideas. The environment becomes learner-centred, and the experiences and knowledge of all class members are reinforced and validated. Teacher-student and student-student relationships can be stronger online than in traditional classroom environments.

Despite the advantages of being anonymous, there is still a need to present a person's authentic self, such as appearance and behaviour, to others. People feel uncomfortable if they cannot ascribe gender, race, class, and language to another person (Kirkup, 2001). One of the most common questions asked in online chat rooms is about age, gender or sex, and location, or "a/s/l" (Subrahrnanyam, Smahel & Greenfield, 2006). Many of my students often intentionally seek out the personal details of their classmates by asking where they live, what courses they are taking, their relationship status, and other personal and identifying information.

At its most creative, anonymity not only provides students with an opportunity to alter or suppress features of their identity or personality, it allows them freedom to construct a new identity. Burbules (2002) argues that these are not false or lesser identities but simply different versions of actual identities. He believes that, when engaged in online interactions, the aspects of our real embodied selves are not fully abandoned but are used in different and supplemental ways.

So how does a learner develop an online identity? Inherent in the virtual learning environment are three main influences that will help create a learner identity: textual identity, visual identity, and behavioural identity. From the convergence of these influences, one composite learner identity emerges.

TEXTUAL IDENTITY

Deemphasizing a physical identity can encourage the emergence of a more substantial writing identity (Blake, 2000). The quality of the student's writing can give us many clues. We can tell what they're thinking, what they understand, and what their biases are. We can also get a sense of their social and cultural backgrounds. Moreover, since textual identity is the primary academic identity, having students create more substantial writing identities provides springboards for more academic modes of discourse.

Academic identity

An academic identity gives us insight into the student's learning (Blake, 2000, p. 191). Students often feel more comfortable contributing to online discussions than they would in classroom discussions. When students realize that their thoughts will be exposed to others, often semi-permanently, it inspires a deeper level of discourse and more profound learning in this safe and somewhat anonymous classroom (Burbules, 2002; Smith et al., 2002; Walker, 2003).

Given that much of online learning is text-based and predicated on writing and language skills, students with language difficulties find that posting carefully edited perspectives can be more effective to their learning and to that of others than speaking in front of a class. Conversely, there is a problem with relying on a student's writing identity. When writing is the only mode used to demonstrate knowledge in online courses, poor writers may be given an academic identity that does not accurately represent their level of understanding or ability.

Smith et al. (2002) also found a person's consistency in writing and expressing ideas and attitudes helped instructors not only get a sense of the student's identity, but it was strong enough to help minimize the issue of online cheating (p. 66). In my courses, it is easy to spot a student's work when I compare their writing style in their postings with their more formal assignment submissions.

Social identity

Social identities are not completely anonymous in the online classroom, as they might be in other online activities. For example, students' names can indicate gender, race, or nationality (Blake, 2000).

Writers' word choices and modes of discourse, such as slang and humour, can also suggest social identities (Blake, 2000). As in face-to-face interactions where the receiver perceives an unintentional non-verbal message from the sender, in online communication the writer's personality is evident in their word, punctuation, and grammar choices.

VISUAL IDENTITY

If writing gives us some clues to a person's personality and identity, the same can be said about how writers portray their physical selves online. The issue of the visual representation of a learner's physical appearance in an online learning environment centres around three possibilities: whether or not to include a photograph, the choice of an image to represent the learner, or the construction of a new image.

Learners are often asked to post biographies or pictures of themselves as a way to create a social community in the virtual classroom. Most demonstrate that they are familiar with the technical process of uploading a picture to the website, and they appear to be keen to do so. In my seven years of teaching online with over 600 students, there have been only a handful of students who have not had an available digital photograph to use in their course. Even more surprising, only one student has refused to put up a picture. Given the value of being or feeling anonymous, I would have expected more students to resist presenting their physical identities to the class.

One of the most perplexing decisions for learners may not be whether or not to include a picture, but how to choose one that best represents who they are. It is the choice that is significant. The picture that learners choose to share may say more about them than the actual photo (Kirkup, 2001; Hawisher, 2000). Do they choose a picture with their family (secure and traditional), or one cavorting with friends (fun and likable), or one engaging in a sport (outdoorsy and active)? I always am intrigued by the depth of detail that they share with us, such as the student who described his recovery from cancer and posted a picture of himself that showed his cancerous skin lesions.

It is also possible for learners to create an authentic online identity by constructing representations of themselves through altered photos, cartoons, avatars, and animations (Hawisher, 2000). The technology can be used to represent who the learners think they are, or who they'd like to be. This blurring of their physical and virtual selves into something creative might send a clearer message of their identity. One of my students was a police officer who was uncomfortable posting his picture, so he chose to post a picture of a highly identifiable character from the police series *NYPD Blue*. It was a powerful image of the police detective, Andy Sipowicz, standing in front of the precinct, with his arms folded, and his gaze straight at the camera. I got a tremendous sense of who this student was as a result of his choice of photo.

Burbules (2002) notes that a physical body is just one dimension of identity, and it should not be falsely prioritized as the most important. So what else is important? If some degree of personal anonymity and the ability to create a textual and visual identity have empowering and positive influences on learning, what else is needed?[71]

BEHAVIOURAL IDENTITY

Interacting as a member in a community is also pivotal to helping learners develop their online identity. A behavioural identity emerges as learners establish a sense of belonging, are motivated to learn and contribute, and achieve success in online learning. Even if it is via a computer screen, there is an inherent desire for human relationships where one can share identities, engage in discourse, and challenge values (Arbaugh, 2001; Kirkup, 2001; Wingard, 2004).

[71] This issue also arises with blogs.

Authors on the subject of education and e-learning basically refer to two types of online communities: the social community and the learning community. The social community is created when learners and instructors develop functional personal relationships, and it is from this sense of connection and belonging that an effective learning environment can emerge (Blake, 2000; Easton, 2003; Meyer, 2003; Robbin, 2001).

Social communities

In a study of online students and what they consider as distressing when taking distance courses, Hara and Kling (2000) discovered that students do not always consider themselves to be isolated if the class bonds as a community. So, how does an effective social community get established when the members never see each other face-to-face and personal characteristics can be obscured and mitigated?

The development of a social community can begin the moment a learner logs into the course and is welcomed into the virtual environment. Learners often can't help but display their authentic and genuine personalities and beliefs online. I'm often surprised by how many learners will spontaneously post a generic welcome to the class as soon as they've logged in, demonstrating an outgoing and social personality.

In an attempt to include learners who are less social, ice-breaking activities work well. In my course, I ask the learners to create a homepage with a small biography and picture of themselves, to read through the homepages of other students, and then to post welcomes to two other students in the class. Through this activity, the course becomes humanizing, and we all have a better sense of everyone's backgrounds, interests, and levels of experience. It's interesting to me that students tend to welcome only those students who share a similar demographic dimension to themselves.

Yet, it is a paradox to have students post autobiographies and pictures to help establish a social community, because the disclosure may expose them beyond the safety of their anonymity. Perhaps it is of some benefit that I have no way of knowing if the information the students have chosen to share or the pictures they have selected are genuine, and it may not matter to the development of the social community if students are not exactly who they say they are (Burbules, 2002; Kirkup, 2001).

A successful social community requires regular contributions of all the class participants and the use of immediacy behaviours to establish a sense of camaraderie (Arbaugh, 2001; Meyer, 2003; Walker, 2003; Wingard, 2004). Immediacy "refers to the communication behaviours that reduce social and psychological distance between people; it includes both nonverbal and verbal behaviours" (Arbaugh, p. 43). This includes using conversational language in postings, using humour and personal experiences, and addressing each other by name. These contribute to the sense of being important and valued by another.

It is also interesting to note that in an online social community gender differences and gender-related assumptions still exist, as they do in regular face-to-face exchanges (Burbules, 2002; Kirkup, 2001; Meyer, 2003; Subrahrnanyam et al., 2006). For example, males are more likely to post more questions, use concrete speech patterns, and assert their opinions online. Females are more likely to use polite terminology, empathize with others, and avoid disagreements online.

Once learners have established themselves in the social community, further behavioural identities emerge as they become motivated in the learning community.

Learning communities

Just as immediacy behaviours are important for establishing an online social community, motivating behaviours are important for the learners' success in the course (Easton, 2003; Hodges, 2004; Robbin, 2001). The learning community is created when learners can explore new concepts through communicating with others. The role of motivator often falls primarily on the instructor, but learners can contribute to positive and energizing class discussions and can motivate others to participate. Within this transactional and dynamic discourse, explicit learning can take place.

The behaviours that learners demonstrate during this process provide more clues to their identities. Do they work well in groups or prefer to work independently? Are they willing to help others, or do they stay in the background? Often it is the same few learners who confidently post their answers first and, similarly, another group of learners who always read all the other postings and post their comments last. Also, learners may feel more comfortable demonstrating aggressive behaviours in the online environment than in face-to-face encounters (Smith et al., 2002).

Learner behaviour is the last component of the identity composite. Even if the behaviour has been adapted for the online environment, it still represents a valid aspect of a learner's online identity.

SUMMARY

A learner in the virtual classroom follows a progression of initially feeling anonymous and experiencing disidentification, to developing an online identity. Through membership in a social and learning community online, the learner's behavioural identity emerges. A learner's written discourse creates a textual identity that gives insight into his or her academic abilities and social background. Pictures or visual representations create a visual identity.

Once all these textual, visual, and behavioural cues are put together, like pieces in a puzzle, an online identity emerges. A learner's online identity isn't a brand-new identity, nor is it a false identity. It is simply a new version of an already existing identity, which has been tailor-made to maximize e-learning.

Secondary school participation in online learning environments

by Tod Anderson

As we delve into the exploration of what comprises a quality *online* learning environment, we quickly discover that we are exploring what makes up a quality *learning* environment.

OVERVIEW OF ONLINE LEARNING IN THE SECONDARY EDUCATIONAL SYSTEM

Between slaughtering aliens in Halo 2, downloading music to her iPod, updating her profile on myspace.com, and chatting with her friends online, a 17-year old grabs some information from the Web to enhance her essay on the role of Lady Macbeth in Shakespeare's well-known tragedy about unfettered ambition. She takes one last scan of the essay and then emails the file to her instructor. It will be up to a week before she hears a response from her teacher about her writing. She simply moves on to her poetry unit, letting her copy of *Macbeth* fall behind her desk and into the realm of dust bunnies and unclaimed pencils. She will revisit *Macbeth* once more when the email from her instructor comes and she quickly scrolls to the bottom of the file to see her final mark on the assignment. With a grin, or a frown, at the result, she closes the file and picks up her poetry anthology. *Macbeth* is behind her and she is left to prowl the textual maze of poetry.

While much research and effort has been devoted to the creation, implementation, and deployment of distributed, virtual, and online learning at the tertiary level, less time has been devoted to the secondary education system, though in teenage bedrooms and at kitchen tables across the country those same students have taken up the technology with a vengeance.

In an attempt to understand the impact on the school systems of increasing teen digital usage, we take a look at the Canadian secondary school system as an example of the range of methods available for delivering content for online learning, and the challenges of delivering a meaningful educational experience to students with a huge scope of needs, experiences, and motivation.

> "Learning takes place not in an institution, but in social networks and communities." (Downes, 2006)

The real key to learning (whether online or not) is the students' level of interaction with the content, the instructor, and their peers. Creating the opportunity for this varied interaction in an online environment is the greatest challenge for designers and teachers of online courses for secondary school students.

My discussions with online secondary school teachers from across Canada have revealed that there are four main categories of online learning environments in use in secondary education:

- *Self-paced asynchronous*: Students work through the material at their own pace and at times and places of their choosing.
- *Paced asynchronous*: Students work through the material at a pace set by teachers, but at times and places chosen by students themselves.
- *Paced synchronous*: Students work through material at a pace and at a time set by their teachers. This most closely mirrors a classroom situation and may include live video feeds of teachers in classrooms delivering lessons.
- *A combination of both synchronous and asynchronous*: Students are required to meet online at set times, but can also work independently at times of their choosing.

Each one of these methods has strengths in regards to pedagogical approaches and learning. For instance, asynchronous communication (e.g., using online discussion boards) often provides venues in which students engage in more meaningful discussion, because they have a greater chance to reflect on their contributions and have an equal opportunity to voice their thoughts (Murphy, Drabier & Epps, 1998). Synchronous communication can often be less teacher-dominated than in a face-to-face environment, and it provides a social presence and sense of community for the students (Walker, 2006).

Online secondary school instructors and those working to put such systems in place must be familiar with the strengths and weaknesses of their styles of delivery in order to anticipate the best ways to support student learning and engagement. Table 29.1 summarizes the benefits and challenges of each category.

In general, synchronous courses allow for increased interaction, particularly among peers, but they also decrease the flexibility of courses being offered. Synchronous courses reduce the control students have in regard to choosing the time and place to study and also impose more traditional time limits on student responses. Thus, synchronous courses may not take advantage of the greater opportunities for student reflection afforded by asynchronous courses. Understanding these differences can help teachers and administrators appreciate the differing challenges of each.

CANADIAN EXAMPLES

As discussed previously, secondary online learning has many different methods of delivery. An important factor affecting choice of method of delivery is the provincial or territorial approach to online learning. Even a technologically advanced country such as Canada shows wide variations as each province and territory deals with online learning in a way that is unique to its population and educational philosophy. These approaches can be viewed on a spectrum. For example, we have a market-based approach in British Columbia, which has individual school districts developing their own distributed learning programs. These can then be used to attract students from outside the school's catchment area, and students are free to enroll in such institutions while concurrently enrolled in a brick-and-mortar school, while Nova Scotia and Alberta have adopted a more centralized approach.

Table 29.1. Benefits and challenges of online education

			Engagement with		
Categories	**Benefits**	**Challenges**	**content**	**teachers**	**peers**
Self-paced asynchronous	Student as independent learner has greatest control over time, place, and pace of studies.	The motivation needed is often lacking in adolescents. Delayed feedback from the instructor is often no longer relevant to the student. Students don't have immediate access to teacher or peers.	significant	fair	slight to non-existent
Paced asynchronous	Allows for more structure. Teacher dictates how much time should be spent in particular areas. Group work becomes possible. Student still controls time and place of studies. Teacher feedback often occurs more rapidly and thus may be more relevant.	Places restrictions on the pace of the program. Students who cannot keep up get left behind. Students must start the course at the same time. Students don't have immediate access to teacher or peers	significant	fair to significant	slight to fair
Paced synchronous	Allows immediate interaction with teacher and peers. Teacher plays a much larger role. Feedback can be immediate as well as delayed.	Student choice of time, place, and pace is limited. Technology often plays a larger role.	fair to significant	fair to significant	fair to significant
Paced combination of both synchronous and asynchronous	Provides structure and flexibility. Harnesses more direct communication (real-time audio, video, or texting), and indirect communication (discussion boards, email, wikis) with teacher and peers.	Places restrictions on the pace of the program. Students who cannot keep the pace get left behind. Varied technology needs. Students must start the course at the same time	fair to significant	fair to significant	fair to significant

BRITISH COLUMBIA IN FOCUS

Given that British Columbia has the most diversity and activity in terms of online learning, the province lends itself to closer observation. Online teachers in British Columbia overwhelmingly view teacher-to-student interaction, teacher feedback, troubleshooting, assessment, and questioning as all very important for student success, though they are split on the notion of whether peer-to-peer interaction is also important for success. We should note that this division stems from the type of learning environments in which students are working, where self-paced, asynchronous courses preclude peer-to-peer interaction due to the independent nature of the courses, even though most teachers value such interaction and try to create opportunities for it.

The other reason for this division is more philosophical. Some teachers believe that you can learn the subject matter without peer-to-peer interaction, or that independent students do not value peer-to-peer interaction, so do not include interaction as part of their courses. Diaz and Cartnal (1999) found that independent learners were inclined to be less collaborative and dependent within online groups. This makes it difficult to ensure that the quality of content and teacher interaction is at a level that provides an engaging learning experience.

The challenges of achieving active student participation in an online course are myriad, but survey respondents in British Columbia felt that time commitments and increases in teacher workload were the two greatest challenges they faced. These challenges tie into Smith, Clark, and Blomeyer's recommendation (2005) that professional development should be preparing "highly qualified" online teachers. This contradicts the notion that online teaching gives teachers more time and should be underlined when considering such programs.

CHALLENGES OF ADOLESCENT ONLINE LEARNERS

As noted earlier, research into adolescent online learners lags behind research into adult online learners. The research on adult learners may not be applicable to adolescents because the populations differ, especially in regards to at-risk learners, and when online education is not elective, but a choice of last resort. After dealing with issues involving at-risk learners, we present perspectives on the future of online learning.

At-risk learners

In the Canadian secondary school system, online learning still resembles a poor cousin of face-to-face education. For example, the funding for programs such as distributed learning is based on fractions of full-time equivalencies (FTEs), which allows funding only as a portion of the face-to-face budgeting levels. Supplementary grants are available, but only under special circumstances (BC MOE, 2007). Thus, we find that the students at our door are often those for whom the traditional brick-and-mortar system is unsuccessful. Funk (2006) states that at-risk adult learners are more likely to take online courses, which seems to apply to secondary students as well.

Students who are unsuccessful in the traditional classroom are often the first students to look for alternative methods of education. As Donnelly (1987) writes, "Family problems, drug addictions, pregnancies and other problems prevent them from participating successfully in school. As they experience failure and fall behind their peers, school becomes a negative environment that reinforces their low self-esteem." If these problems end up channelling such at-risk students into online learning, it may serve to hide the true potentials involved. As Smith, Clark, and Blomeyer (2005) suggest, additional preparation or counseling of first-time online students for the express purpose of supporting the success of students should be built into student support systems.

The future of online learning

Currently, a great deal of research has gone into student motivation, and it seems likely that online students may need a higher degree of motivation than their traditional counterparts, as the distance from the instructor allows them greater freedom than in a traditional classroom setting. Tied in with motivation is the need for explicit instruction on time management, planning, and strategizing. As online students are freed from the schedule and strict time requirements of brick-and-mortar classrooms, it is naïve to assume that those frameworks will be magically replaced by frameworks created by the student, with no guidance from the instructor or teacher.

Predictive assessment is another area that should be considered, especially to make clear the potential deficiencies that online students may have. We tend to shy away from predictive assessment in the present face-to-face classroom to avoid creating self-fulfilling prophecies, yet these assessments may act as gate-keeping mechanisms to help ensure success or identify specific needs on the part of students.

CONCLUSION

While online learning in the secondary school system may still suffer from a general impression that it is a second-choice option, the increasing number of students choosing to study in this manner and the range of options that exist across Canada indicate that online learning will continue as a viable alternative to brick-and-mortar schools. There is no single method to serve all students, but as we see more research being conducted, and best practices published, the quality of online learning will increase. We can hope that there will be a blending of traditional methods and online courses with the tools of online learning brought into the classroom to enrich the classroom environment, allowing students a much greater range of choice. In the next section, we examine the reification of that identity as it appears at the end of the education process through examining the concept of e-portfolios.

Introducing e-portfolios

by Karen Barnstable & Kathryn Chang Barker

An **e-portfolio**, in simplest terms, is an electronic portfolio of all learning: that is, knowledge, skills, and abilities acquired through formal, non-formal, informal, accidental, and incidental learning. E-portfolios can be used by individuals to demonstrate learning and personal achievement, by educators and employers to assess ability and employment suitability, and by agencies and businesses to show positive change and organizational achievement.

In broader terms, the phrase e-portfolio is used to encompass tools, products, and systems that can be used by individuals, educators, employers, and entire nations for the purposes of describing, assessing, recognizing, and using knowledge and skills acquired through all forms of learning with evidence that is digitally created, stored, and managed through practices that meet standards to assure transportability, usability, and security. At its simplest, an e-portfolio may resemble a personal homepage or an electronic resume and, at its most complex, it may become a person's digital identity.

PROCESS AND PRODUCT

The e-portfolio has been more formally defined as "a collection of authentic and diverse evidence, drawn from a larger archive representing what a person or organization has learned over time on which the person or organization has reflected, and designed for presentation to one or more audiences for a particular rhetorical purpose" (National Learning Infrastructure Initiative, 2003). We shall focus on two central concepts in this definition, the digital archive and the purpose-driven presentation.

Until recently, e-portfolio tools focused largely on the presentation of information, with an archive of digital data that derived from the associated purpose of the presentation. In other words, the archive was created with the purpose in mind. However, new e-portfolio tools include digital environments for assembling and managing documents and all forms of media in a digital archive, as well as software applications for assembling and sorting portions of that archive for a specific purpose such as applying for a job or seeking course credit. In the future, the archives will come first, with e-portfolios created when and as needed.

At this point, there are several tools for producing e-portfolios, but few for receiving and processing them. That is to say, tools are made available to students, for example, to present their acquired learning to teachers for assessment and credit, but processing those e-portfolios can be very labour-intensive. Currently, e-portfolio systems are being developed for use by their recipients, with software applications that may be used by both creators and processors (typically standards-based e-portfolios) or software applications that can pull what a processor might require from any e-portfolio tool; for example, through use of word search or a marking rubric.

In summary, the e-portfolio is about both process and product. E-portfolio tools help creators to identify and reflect on the outcomes of learning experiences and to produce archives and presentations. One particularly appealing part of the e-portfolio is the use of multimedia, for example audio files that can demonstrate language or musical competence, video files for demonstrating skills, and social networking and blogging for establishing references.

APPLICATIONS AND USERS

Individuals may use e-portfolios to demonstrate their own lifelong learning and achievements. Sometimes individuals create e-portfolios more as process than product, focusing on reflective learning than showcasing themselves. In their digital archives, they may assemble all the formal, digital records that exist about them and their learning created by themselves and/or created by others, for example health providers and police departments.

Educators may use student e-portfolios to assess student learning, the quality of courses, and entire institutions. Trainers may use e-portfolios to assess prior learning, target training, and provide alternative credentials. And, like all others in the employment environment, educators may use their own e-portfolios for learning management and career advancement. This is becoming increasingly relevant to higher education faculty, as threats to the concept of tenure accelerate.

Employers may use e-portfolios for recruitment and placement purposes, especially in knowledge-based environments. More importantly, they can better use the entire inventory of skills and knowledge in their workforce in a practice known as human capital assets management.

Entire nations may provide the opportunity for citizens to have a digital archive. This is a complex public policy area to be explored. Visionaries argue that, in a digital world, each person must be able to present himself or herself digitally. Cautionary arguments are that our unofficial digital identities already present opportunities for identity theft and other forms of fraud. From this perspective, there is a great deal of digital information out there for every person, and the personal archive becomes a place to assemble that information and take ownership of it. Typing your own name into a tool such as ZoomInfo (http://www.ZoomInfo.com) may reveal to what extent your digital identity can already be assembled from documents found online.

From yet another perspective, e-portfolio tools provide for transparency of credentials and work experience to enable recognition of foreign credentials and to promote labour mobility. There is vast utility to creating and using both a digital archive and a digital identity for all citizens, as an opportunity and not a requirement.

THE NEW MANAGEMENT OF LEARNING

In the past, we've formally managed learning by awarding and expecting credentials; this has been the function of the formal education system and various professional bodies. Employers use credentials as a proxy for acquired skills and knowledge, and have, until now, had few other efficient tools for assessing actual skills and knowledge that individuals represent. We now understand that people acquire skills and knowledge from formal, informal, and non-formal learning in the workplace and the community, from accidental and incidental learning in travel and human relations. However, until comparatively recently, we had no tools for managing that learning effectively and efficiently.

The digital archive is the place to record learning in a range of environments over a lifetime; the e-portfolio becomes a presentation drawn from the archive for a specific purpose. This gives recognition to all forms of learning and, more importantly, the opportunity to use all forms of learning for the good of the individual, community, enterprise, or nation. While a purported e-portfolio that contains only formal learning is a simple digital transcript, the e-portfolio can be an alternative credential for those without formal credentials, such as early school leavers, and for those without recognized credentials, such as foreign-trained workers.

The process of creating both an archive and an e-portfolio is one of translating experiences to a set of skills and knowledge and providing supporting evidence. More explicitly, the process is one of collection, selection, reflection, projection, and presentation of learning. Without evidence of these processes, an e-portfolio is a simple digital resume.

PRINCIPLES OF E-PORTFOLIO SYSTEMS

Using e-portfolios, including digital archives and tools for end-users, requires attention to making them effective and efficient. The first time students are told they can't take their e-portfolios with them to the next level of education, or to the workplace, they will question the value of creating a second e-portfolio. The first time employers receive a mountainous stack of e-portfolio applications for one position, they may question the wisdom of the process.

To avoid problems of this sort, e-portfolio practitioners worldwide have agreed on the following principles for e-portfolio initiatives:

- *Ownership*: Digital archives and e-portfolios are developed and owned by the individual or organization creating them. The use of both or either, and any changes to them, are under the control of that owner. Both are confidential and access is controlled by the owner.
- *Scope*: The e-portfolio can maintain a complete inventory of skills and knowledge acquired by the individual through formal or non-formal learning. The e-portfolio development process includes thoughtfulness about learning represented in the portfolio.
- *Usability*: An e-portfolio system lists and describes skills and knowledge in a way that is recognized and respected by educators, employers, professional bodies, and others who receive and process e-portfolios. Where possible, the e-portfolio system links to established competency standards but also allows flexibility to accommodate unique or non-specific competencies.
- *Accuracy*: The content of the e-portfolio is current, accurate, and verifiable. Methods of validating learning are flexible, appropriate, and credible.
- *Accessibility*: To develop the e-portfolio, there are explicit instructions with examples, a universally recognized glossary of terms, and professional assistance if required. The e-portfolio is easy to access, use, and modify by the owner.

- *Format*: The e-portfolio and archive can incorporate a variety of media.
- *Transportability*: The e-portfolio is portable and interoperable in a technical sense.
- *Purpose*: The e-portfolio service is multi-purpose, customisable, and adaptable to various uses that include assessment by teachers, learning through personal reflection, planning, and individual or community asset mapping.
- *Extensibility*: The e-portfolio system is seamless, allowing the individual to create many versions, from primary through higher education and career training to the workplace and lifelong learning environments.
- *Security*: The e-portfolio system provides secure long-term storage, privacy, access, and ongoing support.

E-PORTFOLIOS IN FORMAL EDUCATION

An e-portfolio provides both evidence of a person's learning and of reflection on his or her own work. It is a record of learning, growth, and change; and it provides meaningful documentation of individual abilities. Examples of types of portfolios in formal educational settings include:

- *Developmental portfolio*: documents individual student improvement in a subject area over a school year and can be used for student evaluations and parent conferences.
- *Teacher planning portfolio*: uses an existing portfolio system, possibly commercial or online, to receive information about an incoming class of students.
- *Proficiency portfolio*: a means of determining graduation/completion eligibility, usually requires students to complete portfolios in certain areas of target proficiency.
- *Showcase portfolio*: documents a student's best work accomplished during an entire educational career; may include research papers, art work, and science experiments.
- *Employment skills portfolio*: used by employers to evaluate a prospective employee's work readiness skills.
- *College admission portfolio*: usually a showcase portfolio, used to determine eligibility for admission to college or university.

Portfolio assessment combines many innovations in the appropriate assessment of learning, including alternative assessment, authentic assessment, competency-based assessment, flexible assessment, and standards-based assessment:

- *Alternative assessment* refers to alternative means of enhancing educational assessment through techniques such as confidence measurement, analysis of self-awareness, and performance evaluation.
- *Authentic assessment* involves examining students' basic skills, control of information, high level of understanding, personal characteristics, and habits of mind, and it allows students to participate actively in their own learning.
- *Competency-based assessment* is the assessment of competence against standards set for knowledge and skills in a particular area, typically used in vocational education and professional certification processes.
- *Flexible assessment* can include checklists, portfolios, performance tasks, product assessments, projects, and simulations; observation of the learner, questioning, oral or written tests and essays, projects undertaken in groups or individually, role playing, work samples, and computer-based assessment. Flexible assessment is intended to suit the learner's pace and style of learning and to assess the individual when he or she is ready.
- *Standards-based assessment* is intended to measure achievements against stated learning outcomes or objectives.

Combining elements of all the above, portfolio assessment involves using the products in a portfolio as the evidence of learning for assessment purposes. The advantages of a portfolio for assessment purposes are:

- Portfolios provide a wealth of information upon which to base instructional decisions.
- Portfolios are an effective means of communicating students' developmental status and progress.
- Portfolios can serve to motivate students and promote self-assessment and self-understanding.
- Portfolios contextualize assessment and provide a basis for challenging formal test results based on testing that is not authentic or reliable, as in the case of a single test score.

In terms of portfolio assessment, the single greatest concern has been validation or verification of the evidence presented. This has considerable implications for the development of learning records. A learning record, whether electronic or not, is of little use if the claims of skills and knowledge cannot be verified. Credentials are relatively easy to verify, and credentials have, in the past, served as a shorthand method of displaying skills and knowledge. However, if we are dealing with a learning record, we are not dealing with a final battery of tests, but with the gradual accumulation of knowledge. Thus, the integrity of a learning record becomes a crucial issue. We need to consider exactly what evidence needs to be gathered and how we can validate that evidence reliably and in a way that is not so time-consuming as to be impractical.

What is the future of e-portfolio assessment? There is a trend towards technology-assisted assessment of learning at all levels of learning systems. Areas of interest to watch include:

- e-portfolios for formative assessment (a specific purpose);
- e-portfolios and reflective learning (assessment of one type of learning);
- e-portfolios as a transition tool (between grade levels);
- assessment of learning across subject matter "silos";
- self-assessment of learning;
- assessment of lifelong learning.

GETTING STARTED ON AN E-PORTFOLIO

In this section, we offer some simple guidance to those wishing to assemble their own e-portfolio that summarizes, highlights, and validates:

- who you are as a person,
- what you know and can do, and
- what you hope to do.

It will be an evolving work as you add documents that demonstrate your most current skills or delete those that are no longer so relevant to who you are or what you can offer. With this in mind, you will want to follow a systematic process to help you identify what to include and how to present it. The CROS (collection, reflection, organization, and selection) system is a tried and tested system that has assisted many people with the development of their e-portfolio.

C—Collection

Search through your file folders, boxes, and computer documents for any evidence that says something about you and your skills. Keep an ongoing list of what you have FOUND. This will help you to keep track of what you have so that it is not forgotten later. Other lists you will need are TO FIND, TO REQUEST, and TO CREATE, used to incorporate items that you have temporarily mislaid, for example, that you will need to ask former employers to provide, and that you have lost permanently when moving house or through a disaster such as a computer crash.

R—Reflection

Reflecting on our learning and our lives in general has become one of the most emphasized processes in education. It allows us to gain a better sense of who we are, what we have done, what we know, and what our goals for the future are. It may also help us to see patterns in our lives and to evaluate professional and personal growth.

You may want to begin by reflecting on your skills in general, using questions such as those listed below. This will also generate ideas for any further iterations of the collection cycle:

- What three words describe me best?
- What are my five top skills?
- What are my short- and long-term goals?
- What are my greatest strengths?
- What are my major accomplishments?

To help you determine the usefulness of each item that you have collected for your e-portfolio, you may want to make use of reflective questions such as the following:

- What does this item mean to me?
- What does this item say about me?
- What specific skills / knowledge / attributes are reflected in this item?
- How does this item relate to my short- and long-term goals?
- In what ways does this item demonstrate my strengths?
- What is the importance of this item/activity in relation to my personal or professional growth?
- What barriers or challenges did I have to overcome to realize this achievement?
- What were the results of this activity/project?
- What did I learn from this?

O—Organization

The e-portfolio tool that you choose may determine the organizational system that you use for presenting your evidence. If you have a choice in the organizational framework, there are several approaches to consider.

Chronological: This is an effective way of demonstrating career progression by clearly showing years or time periods. Just like a chronological resume, it is easy to follow and shows career steps by positions, job titles, companies, or organizations that you have worked for. Evidence of skills used or developed in each time period can be displayed.

Thematic: The thematic approach is a more common one. Common categories used include:

- skills/competencies
- education and training
- professional development
- accomplishments
- projects
- community/volunteer
- leisure/hobbies/travel

The simple STAR (skills, training, accomplishments, references) format is a useful way to organize your documents if you don't have a lot of evidence to display.

S—Selection

The final step in deciding what to put into your e-portfolio involves selecting items that will be appropriate for your audience. Some questions to consider are:

- Who are the key people who will be viewing my e-portfolio?
- What exactly will they want to see?
- What is their familiarity with e-portfolios?
- Will they need assistance in navigating through this item of evidence or through the organizational format used?
- How might they evaluate my skills?
- What questions might they ask?

E-PORTFOLIO RESOURCES

We recommend the following sites as points of departure for educators and learners interested in further exploring the prospects, purposes, and possibilities of portfolios in education.

- Educause (http://www.educause.edu/)—North American group focused on learning technologies
- FuturEd eLibrary (http://www.futured.com/)—research company focused on learning innovations
- Learning Innovations Forum (http://www.lifia.ca/)—non-profit agency sponsoring e-portfolio forums
- ePortConsortium (http://www.eportconsortium.org/)—portfolio research at the higher education level

Summary

> "*Slave* is an Ephebian word. In Om we have no word for slave," said Vorbis.
>
> "So I understand," said the Tyrant. "I imagine that fish have no word for water." (Prachett, 2000, p. 356)

Like a fish in water, we are so steeped in the notion of identity that we tend to take it for granted, and we feel that many online initiatives fail, or are not as successful as anticipated, precisely because of this oversight. Though we are seldom aware of the issue until it is brought to our attention, we feel that one of the primary challenges of online learning is the question of learners' identities; how educators working in online environments address this challenge may determine the success or failure of an initiative. We also feel that identities are malleable as well as extensible, so, when we endeavour to foster co-operation and collaboration, we must keep in mind how learners' (and educators') identities have been established and how they can be stretched and adapted in ways to best facilitate online learning. We think it is useful to consider online classrooms expanding not only space (as distant learners can be incorporated into the classroom) and time (as asynchronous CMC permits time shifting), but also in terms of how much more flexible our views of online learners' identities are, and how learners can consciously develop their identities in ways that facilitate learning. Harvey's discussion emphasizes how the online environment is akin to a universal solvent, forcing us to reconsider concepts and ideas, and it is important for online educators to be aware of this when creating and maintaining learning environments.

We then looked at the state of play in a Canadian province, British Columbia, to gain an understanding of issues of learner identity and participation, and how they operate in this setting with relatively advanced online educational offerings.

As a practical example, and a possible end point for educators, we considered e-portfolios, the construction of which involves making a learner's identity concrete not only for evaluation by educators, but also for learners to use to understand themselves and to make their way into the wider world. When viewed through the lens of learner identity, the organizational principles of e-portfolios take on an added significance. It is probably beyond the realm of possibility that the online teacher in lower elementary school classes would be able to teach while having a clear idea of what students will want or need to do 10 or more years in the future, but, by aligning the basic raw material of learner identity with the firmly practical notion of e-portfolio development, we hope to highlight the fact that the elementary educator is connected to final outcomes of online education in serious and meaningful ways.

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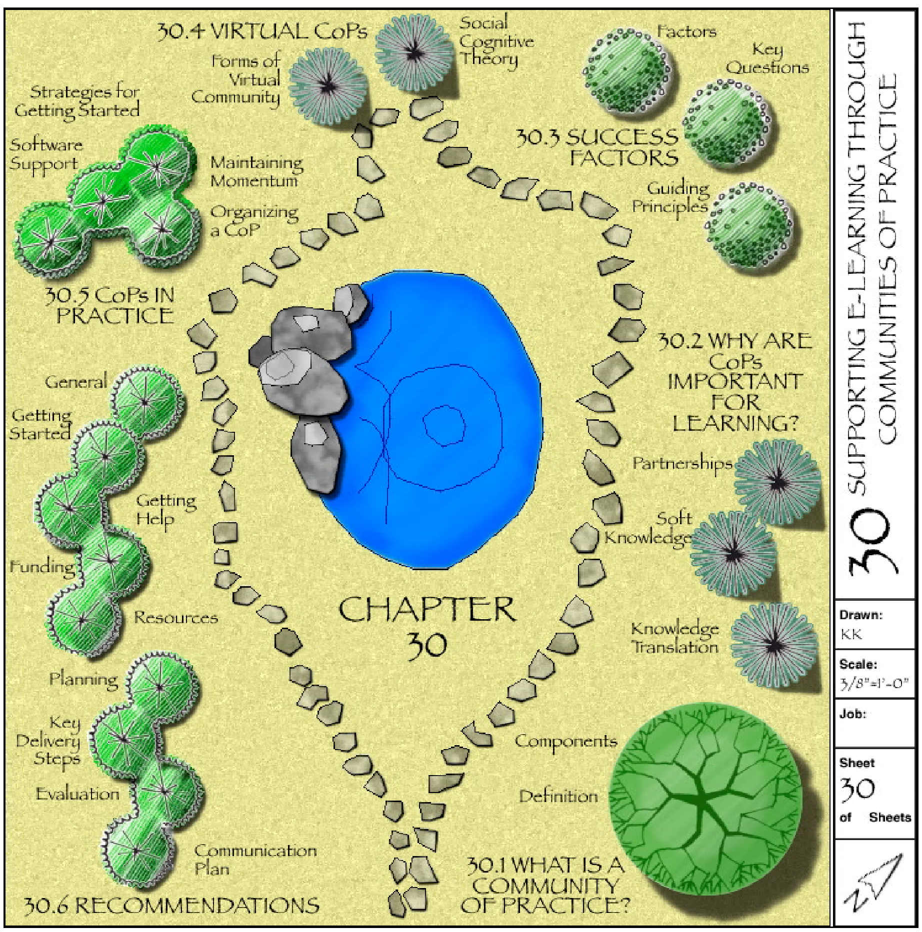
30
Supporting E-learning through Communities of Practice

David Kaufman, Kevin Kelly, and Alice Ireland

A CoP is a persistent, sustaining social network of individuals who share and develop an overlapping knowledge base, set of beliefs, values, history and experiences focused on a common practice and; or mutual enterprise. – Barab et al. (2002)



Learning outcomes

After completing this chapter, you should be able to:

- Describe the concept of *Community of Practice* (CoP).
- Explain why CoPs are important for e-learning practitioners.
- Identify the resources required to develop an online community.
- Synthesize concepts and aspects that comprise successful communities.
- Apply Wenger, McDermott & Snyder's (2002) seven principles of community design to design an online community project.

Introduction

E-learning now makes it feasible for groups to learn and work collaboratively in an online virtual group of knowledgeable, experienced, like-minded peers, regardless of physical locations. These types of groups, called communities of practice (CoPs), can be a powerful support for gathering new knowledge and for putting it into action. CoPs are being used to enhance the success of many businesses, not-for-profit, social action, and academic endeavours.

As instructors in college and university settings are being asked to focus on teaching and learning, we are witnessing the development of a new discipline, the *scholarship of teaching and learning* (SoTL). SoTL has among its goals the understanding and improvement of the teaching-learning process in classroom-based, online, and blended environments. It involves dialogue among instructors about their best practices, and this leads to the development of social communities in which new avenues in teaching and learning can be explored and shared. CoPs, both face-to-face and online, are powerful enablers of these dialogues.

To help you understand and implement CoPs in your context, this chapter presents a practical guide to developing and maintaining your own CoP. It also provides an overview of the conceptual foundations of CoPs. Case studies throughout the chapter describe the conception, growth, challenges, and triumphs of several CoPs in action.

What is a "community of practice"?

The term "community of practice" (CoP) was proposed by Lave & Wenger (1991) to capture the importance of activity in integrating individuals within a community and of community in legitimizing individual practices. Barab et al. (2002, p. 495) defined a CoP as "a persistent, sustaining social network of individuals who share and develop an overlapping knowledge base, set of beliefs, values, history, and experiences focused on a common practice and-or mutual enterprise."

Wenger (1998) proposed three key features of a CoP: (1) mutual engagement, (2) joint enterprise, and (3) a shared repertoire. Mutual engagement involves both work-related and sociocultural activities, achieved through interaction, shared tasks, and opportunities for peripheral participation. Joint enterprise refers to the need for the group to respond to its own, rather than an external, mandate. Finally, a shared repertoire involves the "routines, words, tools, ways of doing things, stories, gestures, symbols, genres, actions or concepts that the community has adopted in the course of its existence" (Wenger, 1998, p. 83).

So we can see that the concept of a CoP is complex and multidimensional, and as instructors make the shift from a teaching focus to a learning focus, CoPs provide an important avenue for e-learning practitioners to expand their repertoire. An online CoP can serve two key purposes: (1) it can provide a place for instructors to share their experiences and learn from one another; and (2) it can provide a place for students to interact with one another and the instructor, and to work in teams.

Example: An Online CoP for Teacher Education
"In 2005, the Faculty of Education at the University of Wollongong in Australia implemented the online community of practice called the BEST site: Beginning and Establishing Successful Teachers (http://www.uow.edu.au/educ/students/best.html). The site has been developed specifically for primary and early childhood teachers, although it is being further developed for other specialized cohorts, such as physical and health education teachers" (Herrington, Herrington, Kervin & Ferry, 2006, para. 18).

Case study: Simon Fraser University Co-operative Education Program

The Co-operative Education (Co-op) program (http://scope.lidc.sfu.ca/) at Simon Fraser University uses an online community that provides innovative and continued learning and reflection opportunities through technologies that enhance the Co-operative Education curriculum. Although its overall goal and intended value were specifically aimed at the delivery of co-op and career materials for students, co-op students were continually encouraged to create their own content so that the community became a resource "for students, by students." The community has since opened to include other membership types such as alumni and co-op employers. To foster this growth, the community coordinator and community host ensure that the community's body of knowledge expands to meet specific member needs and interests.

Why are CoPs important for learning?

CoPs have gained their prominence primarily as vehicles for *knowledge translation (KT).* Focusing on moving research knowledge into practice, Canadian Institutes of Health Research (2004) defines knowledge translation as "the exchange, synthesis and ethically sound application of research findings within a complex set of interactions among researchers and knowledge users. In other words, knowledge translation can be seen as an acceleration of the knowledge cycle; an acceleration of the natural transformation of knowledge into use". In business and not-for-profit settings, CoPs have gained prominence as support for problem-solving, as well as the articulation, management and communication of often tacit, experienced-based knowledge (Wenger et al., 2002; Wenger & Snyder, 2001). Speaking generally, KT involves an active exchange of information among various stakeholders, such as researchers, policy makers, administrators, private sector organizations and the general public.

Example: Developing a CoP around KT resources

The Mechanical Engineering Community of Practice (ME CoP), started along with the National Digital Learning Repository in Ireland. "This CoP includes all educators involved in any aspect of mechanical engineering teaching and learning at third level in Ireland. One of the aims of this community is to develop a library of quality digital resources that can be used in mechanical engineering education. This CoP also aims to provide pedagogical and technical advice on developing learning resources; organise delivery of information workshops and seminars; and organise conferences to further enhance teaching and learning practice in mechanical engineering education" (http://www.ndlr.ie/mecheng/blog/).

More recently, other terms have been proposed for essentially the same broad concept. These terms include *knowledge mobilization* (SSHRC, 2006), *knowledge utilization* (Caplan, 1978), *knowledge exchange* (Ofek & Sarvary, 2002), *knowledge management* (WHO, 2006), and *knowledge transfer* (CHSRF, 2003).

Some writers have distinguished "soft" from "hard" knowledge (Kimble et al., 2001). Soft knowledge can be gathered in a domain through sharing solutions to a particularly difficult problem, describing idiosyncrasies of particular tools, equipment, or processes, and recounting and reflecting on challenging events (i.e., recounting war stories). This refers to the implicit, or tacit, knowledge in a domain. CoPs are central to the creation and maintenance of soft knowledge.

Partnerships are at the heart of all KT activity (CIHR, 2004). Effective KT is dependent on meaningful exchanges among network members for the purpose of using the most timely and relevant evidence-based or experience-based information for practice or decision-making. CoPs are natural places for these partnerships and exchanges to start and grow. Relevant learning occurs when participants raise questions or perceive a need for new knowledge. Moreover, Internet technologies enable these discussions to occur in a timely manner among participants regardless of physical location and time zone, with discussions archived for review at a later date or by those who miss a discussion. Case studies throughout this chapter will illustrate CoP contributions to learning in action.

Case Study: BCcampus

BCcampus, a virtual CoP for e-learning educators, was founded in 2003 and illustrates many of the principles outlined in this chapter.

BCcampus is an online service connecting students and educators to programs and resources across all 26 public post-secondary institutions in British Columbia, Canada. BCcampus provides a single access point for students who want to take post-secondary courses and programs by distance. Through BCcampus students receive online support services, including course and program information, advising, admission, registration, library, and course delivery services. BCcampus also supports educators across the public post-secondary sector. Through BCcampus educators receive development funds for creating online learning resources, access to a shareable online learning resources (SOL*R) repository, training, and dissemination of best practices and support for communities of interest.

Discussions in the BCcampus online communities have explored a diverse set of issues, including how to teach science labs online, how to invigilate online exams, the use of e-portfolios for adult basic education, copyright, and assistive technologies for the visually impaired, to name but a few. The community has found that live events featuring or profiling expertise of interest to members often cause a ripple of excitement and interest that can be built using pre-event activities and sustained using post-event activities.

BCcampus organizers have found that ongoing programming and planning are needed to sustain their online groups. Both formally organized and impromptu events take place in the online communities; activities have featured live coverage of educational conferences, advice on the pros and cons of various tools and technologies, aggregated blog feeds, job postings, calendaring of professional development events, technical help and how-to's, virtual conferences, podcasts, webcasts, use of virtual offices, and a myriad of others.

Combining text, images, audio, animations, and other rich media into these activities makes the use of the online community interesting and engaging. BCcampus members use star ratings, comments, and linking of content to other similar content as an essential means of highlighting items of particular interest or providing editorial comment.

This online community has not only served as a vehicle of knowledge mobilization, it has also served to identify and network practitioners with expertise, enhancing the reputation of members across the entire public post-secondary system.

Factors related to CoP success

> What makes [communities of practice] successful is their ability to generate enough excitement, relevance and value to attract and engage members . . . nothing can substitute for this sense of aliveness. (Wenger, McDermott & Snyder, 2002, p. 50)

Lave & Wenger (1991) suggest that five factors determine the success of a CoP:

(1) the existence and sharing by the community of a common goal;
(2) the existence and use of knowledge to achieve that goal;
(3) the nature and importance of relationships formed among community members;
(4) the relationships between the community and those outside it; and
(5) the relationship between the work of the community and the value of the activity.

Wenger (1998) later added the idea that achieving the shared goals of the community requires a shared repertoire of common resources, e.g., language, stories, and practices.

There are a number of key factors that influence the development, functioning and maintenance of CoPs (Lathlean & LeMay, 2001). The legitimacy of initial CoP membership is important. Commitment to the desired CoP goals, relevance to members, and enthusiasm about the CoP's potential to influence practice are also key. On the practical side, a strong infrastructure and resources are essential attributes. These include good information technology, useful library resources, databases, and human support. Of course, skill in accessing and appraising knowledge sources is important, as is skill in bridging this knowledge to practice. In order to provide these key factors, one or more strong, committed, and flexible leaders are needed, to help guide the natural evolution of the CoP. If professional learning is to flourish, it is critical that community members can learn from positive and negative experiences in a blame-free culture (Triggs & John, 2004).

Millen, Fontaine & Muller (2002) have outlined key questions to address in establishing a CoP, including:

- How will the community be formed and evolve?
- How and when will members join?
- What do members do and how will they interact?
- How will the CoP be supported by the members' organization(s)?
- What value will members and their organizations receive?

Wenger et al. (2002) suggest principles for cultivating CoPs:

- CoPs are dynamic entities and need to be designed for adaptability and scalability.
- They should combine the perspectives of both insider members and outsider participants, and all members should be valued regardless of their level of participation.

- Both public and private spaces are necessary and need to be related.
- Although familiarity is important, challenge and excitement are needed to keep the energy high.
- The CoP must provide value to its members, otherwise participation will be minimal or absent.
- Finally, the CoP needs to settle into a rhythm that works for its members.

Case Study: Small Cities Online Research Community
The Small Cities Online Research Community was and continues to be funded through a Social Science and Humanities Research Council (SSHRC) grant. The original $20,000 SSHRC grant came from the Strategic Research Cluster Programme (SRC) and it was awarded in the fall of 2004. The purpose of the grant was to facilitate the creation of a research cluster.

So far participation in the community has largely been top down; there is a lot of lurking, the term sometimes used for reading without participating. Its organizers realize that having a variety of activities in the community invites participation. With that in mind they have seeded discussions, produced webcasts, offered polls, and produced other events to encourage more active participation. The Small City site allows for daily/weekly/monthly email notices of content updates and more recently a RSS feed has been added to help push communication about these activities out so that those interested in participation are made aware and can choose to participate. All these are ways in which facilitators are fostering participation. Today their major challenge is making community members aware both of the availability of these tools and how to use them.

Online communities must provide their members with value. The Small Cities community provides members with value in the form of easy access to research articles, notices of upcoming events, and communication with colleagues at a distance. They believe that they need to make their members aware, through education, of this value and the possibilities of the community platform.

Virtual (online) communities of practice

Virtual (online) communities play a socialization role just as "real" communities do (Henri & Pudelko, 2003). The theoretical foundation of virtual communities is based on social cognitive theory (Bandura, 1986). This theory makes several assumptions, including: (1) all life experience is a social experience in various communities; (2) learning can be considered as a social process, and is a process of identity construction; and (3) negotiation of meaning is at the base of any individual and collective learning.

Henri & Pudelko (2003) propose three components of the social context of activity in virtual communities: (1) the goal of the community, (2) the methods of initial group creation, and (3) the temporal evolution of both the goals and the methods of the group. Figure 30.1 illustrates these ideas and identifies four principal types of communities:

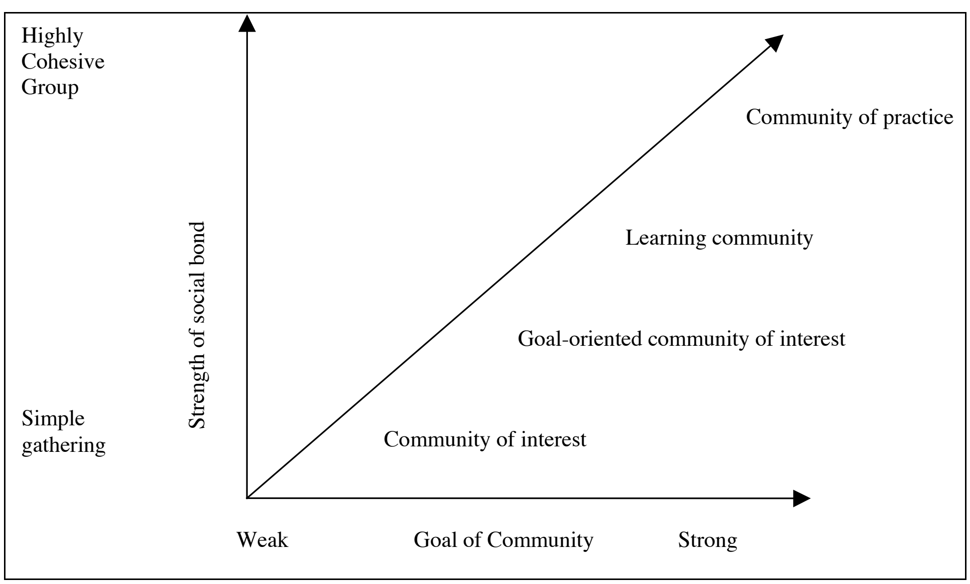


Figure 30.1. Forms of virtual communities according to their context of emergence (adapted from Henri & Pudelko, 2003, p. 476)

Table 30.1. Principal descriptors of the four types of virtual communities (adapted from Henri & Pudelko, 2003, p. 485)

	Community of interest	Goal-oriented community	Learning community	Community of practice
Purpose	Gathering around a common topic of interest	Created to carry out a specific task	Pedagogical activity proposed by the instructor	Stems from an existing, real community of practice
Activity	Information exchange	Sharing of diverse perspectives and production of objects commissioned by the mandate	Participation in discussions of collective topics	Professional practice development through sharing knowledge among members
Learning	Knowledge construction for individual use	Knowledge construction from diverse knowledge systems towards collective use	Knowledge construction by carrying out socially situated activities	Appropriation of new practices and development of involvement

As described here, a full CoP requires a highly cohesive group with a clear goal. A successful virtual CoP generally arises from an existing, face-to-face CoP in which professional practice is developed through sharing knowledge among members. Through this interaction, new practices may be developed and identification with the community can occur.

Table 30.1 outlines the three dimensions that characterize the community types illustrated in Figure 30.1. This shows that many types of virtual communities can exist, but not all are true CoPs.

Virtual CoPs are a recent phenomenon and studies on their effectiveness to enhance learning have not yet been done. Parboosingh (2002) advocates conducting evaluation studies that focus on how the CoP takes advantage of the technology, rather than how the technology affects the CoP.

Case Study: The SCoPE Virtual CoP (Simon Fraser University)

SCoPE, hosted by the Learning and Instructional Development Centre (LIDC) (www.lidc.sfu.ca/scope) at Simon Fraser University in Burnaby, British Columbia, Canada, is an online community for individuals who share an interest in education research and practice. The community participation in SCoPE extends beyond the university to provide opportunities for dialogue across disciplines, geographical borders, professions, levels of expertise, and education sectors.

The core activity for SCoPE is scheduled, topic-based seminars moderated by volunteers in the community. They have scheduled one seminar per month, usually three weeks in length, and have avoided overlap in the schedule. A regular format helps to build anticipation each month, encourages members to revisit the community, and also invites participation from new members who are interested in the topic.

MicroSCoPE, an online monthly update on community and member activities, is distributed to members. This newsletter includes upcoming events, a recap of past events, and information about SCoPE members' activities and achievements, such as conference presentations and awards. Any questions about the community tools that affect participation are noted and included in MicroSCoPE as well. Following each MicroSCoPE issue, there is an increase in activity on the site. However, inasmuch as a monthly newsletter contributes to a community rhythm, a SCoPE community blog (in the works) would provide more timely updates. A blog does not reach the same audience as a community newsletter, so organizers are investigating ways to produce and manage both.

CoPs in practice

If you are considering implementing a virtual CoP, the theoretical background and case studies presented so far should give you some knowledge of what it could accomplish and how it might function. However, getting from start to full operation involves skillful design and ongoing management to ensure success. In this section we outline guidelines and tips to help you begin and facilitate a CoP in your learning context.

GETTING STARTED

A community of practice can form around a common problem or topic, but generally someone has to set up a structure for the community to succeed. Kim (2000) breaks the process of building community into nine strategies revolving around:

- **purpose:** clearly define the community you are building, why you are building it (i.e., what needs it will meet for its owners and for its members), and who its members will be;
- **places:** where you will bring people together. For online communities, places can include mailing lists, discussion

topics, chat rooms, multiplayer games, virtual worlds, a website, or some combination of these spaces;
- **profiles:** ways to introduce members to each other, develop and maintain their identities, and build trust and relationships;
- **roles:** member roles such as newcomer, old-timer, and leader, each of which may have unique interaction and contribution needs within the community;
- **leadership:** those who take on roles to animate and organize the community. Kim's examples of their tasks include greeting newcomers, coordinating events, managing programs, maintaining the infrastructure, and keeping activities lively and civil;
- **etiquette:** behavioural standards or social boundaries that are explicitly stated and agreed on by the community;
- **events:** planned and facilitated events that bring people together and help to define the community and move it forward;
- **rituals:** welcomes to new members, celebrations and other observances to help members feel at home and create an online culture;
- **subgroups:** member-run small groups with common interests, to help create a sense of intimacy and common purpose.

More simply, CoP participation becomes a function of roles and rules. Everyone has something to contribute, whether coordinators, novices, local experts, experts from outside the organization, or something in between. However, there must be some structure related to how the contributions are made. In the online education sphere, we also have to remember the expert-novice paradigm, where "experts" forget what it is like to learn particular information or skills. Often fellow novices have better explanations or advice regarding how to solve a problem, because they themselves just figured out how it works. Including people from outside the organization can inject new ideas into the group and can also help prevent "groupthink."

SOFTWARE SUPPORT

Face-to-face communities can hold physical meetings and events, but how is a virtual community supposed to interact? Technology plays a pivotal role in enabling online communities of practice to grow, to share knowledge and ideas, and to allow members to support each other as people. Choosing which technology to use for these purposes is not an easy task. If you start with a list of your desired activities and resources, you can often find help from technical support staff and Internet sites that review online tools.

Case Study: Technology Decisions for ScoPE

The process of choosing a suitable platform for the SCoPE community facilitated by Simon Fraser University was unexpectedly complex. Although organizers had decided that their most important criteria were ease of use, flexibility, ability to customize, and good communication tools, their preliminary research did not yield any existing community platforms that met their needs.

The technical support staff at SFU's Learning & Instructional Development Centre (LIDC) considered several different solutions, starting with building an in-house solution, then moving to the open source community platforms Sakai and TikiWiki, and finally settling on Moodle (www.moodle.org). Moodle stood out as satisfying most of our user requirements. Moodle took (literally) eight minutes to install, and following initial installation has required very little maintenance by the LIDC technical support staff. Although Moodle was developed as a course management system, branding and customizing its interface and language was straightforward, and making the changes that made SCoPE feel like an online community rather than a course space were easy. The community coordinator has the access privileges necessary to deal with day-to-day operations.

What's the lesson? Select tools that match your specific community requirements and context. There is no single ideal community platform, so plan for a good foundation to build as new uses and needs emerge. This example demonstrates that a cost-effective tool does exist that could be used by an instructor, with minimal support from technical experts.

If your community does not have a technical support staff, do not worry. Since your community is interacting over distance, there is no need to host the community site yourself. Just as some face-to-face communities find a public or private space to meet, you and your online community can use public or private web-based spaces for communication, activities, and more. For example, the SCoPE project hosts its own installation of the Moodle learning management system, but different companies can host Moodle for you for a range of fees, depending on how sophisticated you want to get. The following case study discusses another hosted solution.

Case Study: Technology Decisions for BCcampus

As a new organization in 2003, BCcampus was, and remains, a small organization relying on outside partnerships for provision of services (see the BCcampus Case Study above). Providing an online community was really only feasible via an application service provider (ASP) solution where hardware, software, and technical support resources were provided by a host provider.

LearningTimes (based in New York) was chosen as the host provider because of BCcampus staff's first hand experience in helping launch their LearningTimes.org site and confidence in the underlying technical solution on which their online community services are provided. BCcampus research revealed LearningTimes to be uniquely positioned as an online community provider for the education market and a leader and innovator in the use of online community for education. The online community technology provided by LearningTimes is a customized version of Ramius' CommunityZero platform. This technology is very robust and provides support for a mix of asynchronous and synchronous capabilities, including: text discussion forums, file posting, contributions area, calendar, live meeting rooms, automatic email updates, integrated instant messenger, photo gallery, polls and surveys, announcements, group email broadcasts, basic chat room, related content, search, admin controls, and more.

With LearningTimes' help, the first community in the BCcampus network of online communities was configured, branded, and launched within a few short weeks.

ORGANIZING YOUR CoP

We can think of a CoP in terms of a model of participants and interactions that can guide its implementation. Diagrams of CoP models take a number of shapes, including pyramids, concentric circles and interconnected nodes. To illustrate one possible approach in an education context, we will look at a learning-community model and extend it to a full CoP for researchers, teachers, and students working in a classroom or distance education setting.

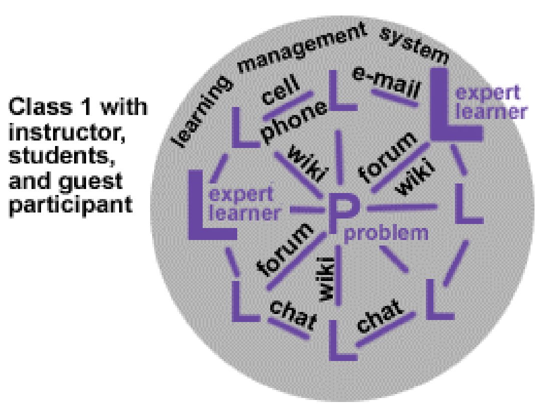


Figure 30.2. Learning community model.

Tom Carroll (2000) suggests a no-boundary model for a classroom-centred learning community consisting of students, teachers, and other resource experts. In this scheme, activity is centred around the problem itself. Teachers become expert learners who actively participate in the learning rather than just guide students from the side. If we apply these concepts to creating an online learning community, we can construct a detailed model (Figure 30.2) that shows not only the interconnections between the learners and expert learners, but also some of the tools that a learning community might use. Wikis, forums, chat, email, and even cell phones and text messaging can be used. The circle in the diagram is not meant to show an impermeable boundary, but a collaborative space for interaction. In this scenario, a guest participant from another university or organization has access to the learning management system (LMS) space for the course that is attempting to solve a common problem, "P."

We can extend this model to a full CoP using Wenger & Snyder's (2001) suggestion of an "overall network structure" with "several layers of participation" centred around the community creators. While their work had an industry focus, there are elements that also apply to learning communities, including layers for charter members, stakeholders, and peripheral community participants, such as the Co-op alumni and Co-op employers. In education, stakeholders might include research grant funding agencies (e.g., CURA), department chairs, college deans, or program assessment coordinators. Peripheral community participants might include support staff and faculty from units, such as the technical support staff at SFU's LIDC who support SCoPE. Charter members might be the first cohorts of students who joined the learning community, and now they continue to participate even though they have moved to other classes or have graduated from an institution like BCcampus.

Since neither model completely meets our purposes, we can refine our own, original model for communities of practice for online teaching and learning (Figure 3). Wenger & Snyder drew boundaries around the core community members, but Carroll makes a good argument to avoid boundaries. On the other hand, Carroll focuses on just one problem, "P," while it is more likely that a learning community would focus on a set of problems. Hence, our drawing below depicts several problems for the community to solve within the same topic area, possibly using the concept of subgroups described by Kim (2000). Learners in different subgroups might only address one problem, as depicted here, but some learners are attracted to more than one problem in the overall set. Expert learners are sometimes invited by other expert learners to collaborate. In our model, the instructor works with peer instructors as well as expert learners in a professional organization. Again, the circles in the drawing do not denote boundaries, but environments used for learning community interactions. For coursework, it might be an LMS like Moodle or WebCT, but for a professional organization it might be a different online space with similar tools, such as LearningTimes.

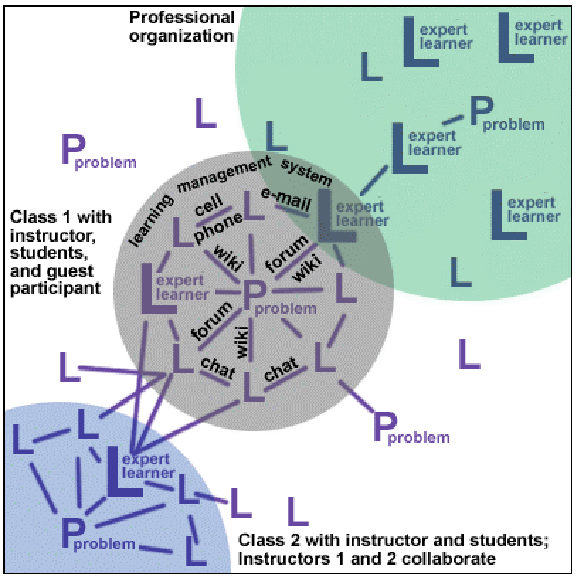


Figure 30.3. An Online Community of Practice for Instructors

As expert learners working in the online environment, we must make it our job to structure both the inquiry and the collaboration around one or more problems related to our course content. Learners can present their findings to other learners, so the set of problems can be distributed among the group. This is similar to the "jigsaw" cooperative learning strategy in which students in small groups specialize in a portion of the total material, collaborate with students in other small groups who have been assigned the same portion, and then teach the rest of their own group.

The next step is to select tools within the community environment (e.g., Moodle, LearningTimes) that would permit this type of collaborative sharing. It is important to start with tools that you are comfortable using yourself, since you are part of the learning community. Remember that the community can use a variety of tools, though, that might not need your direct interaction. In both Figures 30.2 and 30.3, students use email, cell phones, chat, and other tools to communicate and share with each other. They can use wikis, blogs, and forums to record any thoughts about how to solve the problem, where everyone can see it and respond.

The last steps involve facilitating comprehensive interactions, making sure that no one is excluded due to issues of access or the digital divide, engaging external expert learners and learners alike to participate, pushing the learning community to learn as a group rather than as individuals in the same space, and sharing knowledge and experience with people and groups outside the learning community.

Case Study: Organizing the Small Cities Online Research Community

The LearningTimes platform provides a range of options for public and private designation. One option is to set the community security so that it allows previewing, where visitors are allowed to preview (but not post to) the community before joining. Small Cities community organizers decided instead to create a public, dynamic website, which is currently under development as part of a five-year Community University Research Alliance Grant, called Mapping Quality of Life and the Culture of Small Cities, or "Mapping CURA" for short. This public website will be fed from the databases of Small Cities. So, instead of "preview" mode, they have set the community to "restricted" mode, which allows people who have been invited to join by existing members to participate immediately. However, those who have not been invited must first be approved by the founder or an administrator before gaining access. Their policy is to allow anyone to join who is interested, but they are only granted membership to the general member group.

As well, the LearningTimes platform supports the creation of both public and private spaces among its members. An unlimited number of groups can be established, with each having their own private area for file sharing, discussion, polling, or whatever other activities they wish to pursue. Currently, Small Cities has 17 different groups, each with different privileges.

As of September 2006, the community had 140 members of whom 55 were members of the Mapping CURA group. The LearningTimes platform allows them to easily add groups to the community and to restrict access to areas of the community through group privileges. For example, the major tools (Contributions, Calendar, Articles, Discussions, Databases) each have a folder for Mapping CURA that only members of Mapping CURA can see and access. There are other groups that also have their own areas set aside for their unique group interest. The creation of these subgroups is an important means for allowing the community to evolve naturally, rather than forcing it to conform to a static, predefined structure. As interests are identified with the growth of the community, the evolving design permitted by the LearningTimes platform allows members to quickly access and participate in matters of their direct interest.

For example, a conference was held in Kamloops, British Columbia, called "Artist Statement Workshop". One of the requirements of the workshop was to submit presentations ahead of time, which could only be viewed by workshop participants. This was to facilitate meaningful discussion at the conference. The LearningTimes platform enabled creation of a group with appropriate folders that only those participating in the workshop could see and access.

As the community grows, new groups can be easily added with a range of different privileges. This enables private space within public space, much as one can do in the physical world.

MAINTAINING MOMENTUM

Creating a community is only the beginning. To maintain a CoP over time, everyone must keep an eye on common goals or shared themes. Community leaders need to keep the participants' focus on both short-term and long-term objectives and also need to re-energize the community, when needed, through new postings and events. The entire community also bears responsibility for watching particular dynamics that affect any momentum or growth that a CoP has developed. Foremost among these issues are how people feel about the community, how much time they devote to community activity, and how the community was designed for evolution.

People who participate in a CoP must feel that the community is engaging, responsive, and useful in meeting their needs. The participants must also respect and trust each other and others' contributions. Otherwise, they are likely to leave the community, never to return.

Members' time demands can weaken a CoP by restricting their participation. It becomes difficult to deepen knowledge and expertise in an area, as Wenger defines community of practice activity, if members are not interacting on an ongoing basis. Production schedules and academic calendars affect community momentum in different ways. People who are scrambling to meet tight deadlines do not always have time to participate in a community. Conversely, people who work nine-, ten-, or eleven-month contracts have less incentive to continue contributing to a community during the remaining part of the year. They may have to take another job during the down period to make ends meet, or they may take advantage of the lull to take a vacation. This does not mean that your CoP must be so engaging that people participate from Internet cafes near Macchu Picchu, Peru. It does mean that a community may need to adjust its goals to accommodate common fast or slow periods.

As Kim (2000) and others have stated, each community should be built from the start with eventual change in mind. Factors that might precipitate changes include changes for the community members themselves, external events, value changes within the supporting agency, and changes in technology. Whether the community functions in educational or business-related circles, graduation, retirement, relocation, and similar life events may prompt community members to drop out for a while, or indefinitely. Equally important, we need to watch for resistance to a change that might otherwise drive the community forward.

Case Study: Maintaining the Co-op Program Community (Simon Fraser University)

A key element for creating a successful community of practice is to design for evolution. In this case, it is vital to implement design principles that allow for the Co-op Community's own direction, personality, and enthusiasm to lead the way. The design is non-traditional in the sense that the community's organization and structure were not predetermined, nor dictated by the developers. Rather than an out-of-the-box vendor solution or one-size-fits-all software product, many of the community's features are custom-built, based on the needs indicated by the stakeholders.

To ensure the community remains vibrant, a full-time community coordinator and a community host (a Co-op student) work together to address the emergent needs of the members and to stimulate and encourage interaction. This largely involves open and ongoing communication as well as offering support for those Co-op staff members (i.e., Co-op coordinators) who frequently engage with Co-op students.

In this way, the community's social support systems are designed to create room for growth and cultivation of the online space that allows members to play active roles in shaping its features.

Recommendations

To help you begin to create your own community of practice, here are useful recommendations taken from the preceding case studies.

GENERAL

- Select tools that match your specific community requirements and context. There is no single ideal community platform, so plan for a good foundation to build as new uses and needs emerge.
- Document observations in the community.
- Support movement between communities.
- Avoid heaping in lots of content. Rather, model how it can be done and encourage members to contribute.
- Begin working on your own research needs early on. What should you keep track of? What type of agreement do you need with your members to conduct research?
- Research new communication technologies and trends both outside and inside your community. Be creative and responsive in experimenting with tools to support community activities.

HOW DO I GET STARTED?

- Identify an existing gap or need for the target stakeholders (e.g., needs assessment of Co-op students).
- Establish an overall vision or value statement to meet the target stakeholders' needs.
- Actively involve the development team from the inception of the idea to create a community, including participation in brainstorming activities.
- Elicit input about specific needs / requirements / wishes from the stakeholders. Conduct surveys with the stakeholders pertaining to topics for the learning modules and the types of activities they would find useful in an online community.
- Involve stakeholders in planning, design, development, and implementation of the online community.
- Ensure that resources are in place for the project. (This is not an initiative done on the side of one's desk.)
- Build enthusiasm and excitement both internally and externally so that everyone feels they have contributed towards, believes in, and is committed.
- Maintain ongoing project evaluation.
- Monitor and analyze stakeholders' use patterns and satisfaction levels.
- Ensure resources are in place to implement future technical upgrades and development changes as the community grows.

WHO CAN HELP? (HUMAN RESOURCES)

- A development team with multiple perspectives and roles, i.e., Co-operative Education staff, discipline-specific Co-operative Education coordinators, learning designer, instructional designer, experience designer, programmers and systems administrators, intellectual property coordinator, editors, new media designer, project managers, facilitators, and most importantly, students' (Co-op and work-study) involvement in planning, hosting, moderating, and providing input and feedback.

WHAT OTHER RESOURCES ARE NEEDED?

- An online community platform with content management and discussion capabilities
- Server and back-up

WHAT FUNDING IS NEEDED?

- Funding for the multitude of staff roles and expertise, i.e., a community coordinator, community host, marketing materials, and promotional events and prizes, as well as funds to ensure the continued development of existing and new features.

HOW DO I PLAN?

- Identify the overall scope for the online community and different phases as needed.
- Allocate extra time for testing, launching, and unforeseen events.
- Provide promotional items to departments, internally and externally.
- Secure support and buy-in from stakeholders (key for success).
- Ensure that orientations and training are part of the plan. Allot generous time for training.
- Identify milestones within the scope of the online community plan and celebrate accomplishments.
- Conduct a phased-launch approach whereby you advertise then launch the online community to one group of stakeholders at a time to assess their interactions and uses, etc.
- Dedicate a minimum of one full-time staff member/student to administer/monitor the online community.
- Expect that it will take time for the online community concept to take root, and even longer for stakeholders to engage with the online community. Ensure you indicate the direct value each stakeholder group may experience.

OUTLINE THE KEY STEPS IN THE DELIVERY OF THE ONLINE COMMUNITY

- Plan events and promotions (marketing plan).
- Ensure necessary resources are in place to support and maintain the online community.
- As much as possible, make the delivery of the online community appear seamless to the target group.

- Plan to collect feedback from the target group for modifications to the existing processes, features, content, functionality, and the environment (i.e., user interface).
- Ensure continued development and upgrades to the current features and continual updates to content.
- Obtain student (and relevant stakeholder) involvement at all levels: planning, implementation, and contributions.

HOW DO I ENSURE AN IMPACT ON LEARNING? (EVALUATION)

- Gather data from Co-op students while at university and after they have graduated.
- Embed reflective elements whereby students can record/showcase their learning outcomes (i.e., discussion forums, comment boxes, community profiles).
- Encourage a pull vs. push approach (enable self-directed learning) whereby stakeholders are required to think about how the information they are seeking influences them personally, rather than providing them with directive instructions. Allow for inquiry-based acquisition of content.

HOW DO I LET OTHERS KNOW? (COMMUNICATION PLAN)

- Attend conferences, events, departmental initiatives, etc.
- Host information sessions and informal presentations.
- Online promotions (email) are effective, as well as electronic newsletters.
- Ensure a marketing strategy/plan is in place, specifically designed to target individual groups.
- Incorporate the online community URL and relevant information within existing marketing materials (department-level and/or program level).
- Incorporate the various tools into your regular processes (i.e., online event registration, creation of profiles for new intakes, etc.).
- Publish your initiative and findings in academic journals and/or special-interest publications.

Summary

"We cannot seek achievement for ourselves and forget about progress and prosperity for our community … Our ambitions must be broad enough to include the aspirations and needs of others, for their sakes and for our own". – Cesar Chavez

In this chapter we have defined communities of practice, grounded the CoP concept in theoretical background, and offered guidelines and tips to help you get started on implementing your own CoP. Case studies describing several different CoPs illustrate the application of these ideas and incorporate many of the elements of successful communities of practice.

Acknowledgments

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Glossary

Community of Practice (CoP). A persistent, sustaining social network of individuals who share and develop an overlapping knowledge base, set of beliefs, values, history, and experiences focused on a common practice and/or mutual enterprise.

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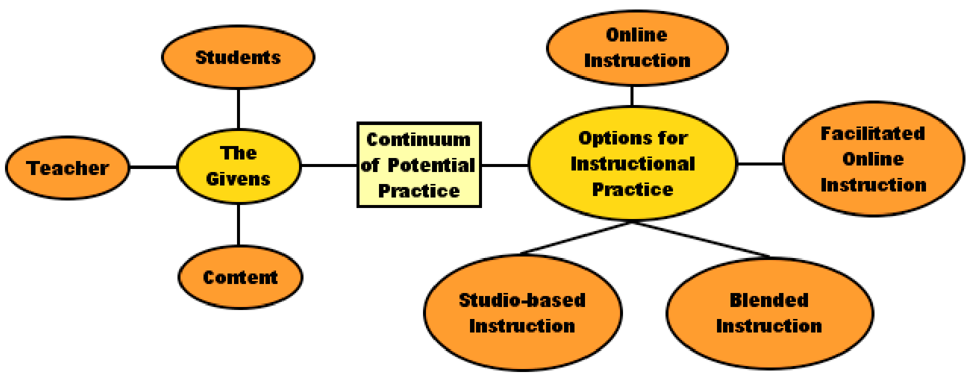
31
Looking Forward: Stories of Practice

Susan Crichton and Elizabeth Childs

Even if you are on the right track, you will get run over if you just sit there. – Will Rogers



Learning outcomes

After completing this chapter, you should be able to:

- Connect content demands, student needs, and instructional strategies.
- Select instructional strategies along a continuum of potential practice.
- Envision a way in which the continuum of practice can inform your work.

Introduction

In this chapter, we distinguish between online and blended learning. The term "online" refers to teaching and learning done totally at a distance, mediated via electronic means (email, discussion boards, electronic conferencing, etc.), while blended learning includes a face-to-face component as well as distance learning, usually with one component supporting the other, depending on the emphasis.

In the K–12 or post-secondary educational environment, these learning options enable students to complete work that they would not otherwise be able to do. Initially, this audience included students with extended illnesses or disabilities who could complete course work that they were otherwise unable to do, or rural students who lacked access to courses required for post-secondary schooling. Increasingly, this audience has expanded to include students who are working towards their personal learning goals, and need access to courses content at their own pace.

In a corporate environment, training is often considered an incentive, something that is available only to the people who are already recognized as high performers. This view tends to deny underperformers the opportunity to reach their potential, although a commonly cited benefit to training in general is that it tends to lead to improved performance and satisfaction and a reduction of staff turnover. Corporate online/blended learning initiatives can make training available to everyone at anytime and in any location.

Historically, online and blended learning is rooted in distance and correspondence education from the mid-1800s (Smith & Crichton, 2003)—much of it pioneered in Canada and Australia. Given this long history, and the variety of settings in which blended and online learning are being used today, this chapter focuses on the realities of creating educational environments in the digital age, and the continuum upon which they can be achieved.

This chapter suggests that online and blended learning, as currently practised, fall along a continuum that ranges from easily recognized teacher-directed instruction (passive, correspondence-type materials) to learner-centred, constructivist strategies (active, student-negotiated, experiential projects). Educators, as never before, have a full toolbox of instructional strategies, methods, and media at their disposal. They only need awareness and opportunity to make rich and meaningful choices for their students.

The definitions below set the context for this chapter and serve as a starting point for building a common understanding of the components that create learning events and environments along the continuum.

Face-to-face learning

Face-to-face learning refers to traditional learning environments whereby the learners and facilitators are co-located for the same purpose and for a pre-determined period of time. Workshops, seminars, courses and conferences that have facilitators or instructors physically present in the same room at the same time with participants or students are examples of face-to-face delivery models.

Online learning

The term online refers to teaching and learning done totally at a distance, mediated through a range of electronic means (email, discussion boards, electronic conferencing, etc.). The Advisory Committee for Online Learning (2001) defines online learning as "what occurs when education and training are delivered and supported by networks such as the Internet or intranets" (p. 1). This definition of online learning highlights the flexible and dynamic nature of the online environment, a characteristic that makes it possible to engage in learning at anytime and from anyplace. Online learning can take a variety of forms. Each of these forms involves a combination of synchronous (real-time) and asynchronous components and includes the following:

- **Blended learning**—Blended learning includes a face-to-face component as well as an online component. In blended learning, the face-to-face can support the online or visa versa, depending on the emphasis placed on the two options.
- **Webcasts**—These refer to the transmission of live audio or video over the Internet. They are the Internet equivalent to traditional radio and TV broadcasting and can be used as stand-alone events that participants register for or as a component of an online course, conference, or session.
- **Podcasting**—This refers to the capture and storage of digital audio files that can then be played back over

the Internet. Increasingly, podcasts are being used as stand-alone events that participants register for or as a component of an online course or conference.

- **Discussion forums**—These are the mainstay of many online learning offerings. Discussion forums or groups refer to online, asynchronous, text-based areas, which can be password-protected or open to all, that provide an interactive discussion via keyboard (typing). For organization and readability, various discussion threads can be established for different topics. In the context of an online course, they are generally moderated by the course facilitator, and student participation is expected. In the context of an online event such as a webcast, discussion forums are generally used pre-webcast and/or post-webcast as a place for participants to further expand and elaborate on the context of the online event.
- **Instant messaging**—This is often referred to as a quick collaboration tool, as it allows two people (or more) to interact back and forth using the keyboard (most often in real time, but not always). In general, participants must be specifically asked or invited to join (i.e., MSN chat, Skype or ICQ).
- **Synchronous collaboration tools**—This refers to a suite of features useful for online meetings, delivered over the Internet via one point of access, and generally password-protected. These features generally include real-time audio discussion as well as document sharing, interactive whiteboard space, text chat, desktop sharing, and the ability to break into small groups for synchronous discussion. In addition, the entire meeting can be recorded for playback later via the recorded meeting link (i.e., Elluminate Live, iLINC). Synchronous collaboration tools are often used to host independent events that participants register for, as well as components of online courses or as online office spaces, etc.

Online courses

Many of the features discussed above are components of an online course and can be combined in a variety of ways, depending upon the needs of the audience, the specifics of the content and unique characteristics of the learning context.

Most often, online courses are delivered through a learning management system (LMS), which allows course materials and content to be stored and usability statistics to be collected. LMSs typically include collaboration tools such as discussion groups and synchronous sessions, all in a web-accessible, password-protected environment. It is also possible to create online courses that function external to an LMS should tracking not be a requirement. While there are a variety of proprietary LMS tools on the market, open source/freeware LMSs are increasingly popular as an alternative to increased licensing costs.

Online communities

This refers to an online collaboration space for people working on a common topic or area(s). The functionality in an online community includes much of what is available in a learning management system but an online community may or may not be course dependent or assignment-driven. Generally, a stand-alone online community includes access to a range of asynchronous and synchronous functions through a single access point. The functions required in an online community include discussion groups, chat, user identification icon, synchronous tools for holding web meetings, file sharing, etc. There is general agreement among educators that an online community requires a facilitator to keep it vibrant, sustainable, and used by its community members.

The studio story

In 2004, I[72] had the opportunity to design a graduate course in digital filmmaking. The decision was made to offer this course via distance delivery.[73] As this was a new distance course, it was critical that it leveraged the existing technology creatively and model sound instructional strategies. Previously, I had taught other online courses, using a variety of software (First Class, Nautikos, Web CT, Blackboard, Elluminate Live!), and, in each of those situations, I had modified my instruction to match the software. This time I decided to try a different approach. I determined the instructional strategy would be studio-based, assuming the software (Blackboard and Elluminate) could be adapted to support it.

The course, Inquiry Into Digital Filmmaking,[74] received very positive reviews from the students. The opening assignment, the creation of a short film, shared within the Blackboard discussion board via links to the students' web pages, served three purposes: (1) as an icebreaker—literally, for one of the students; (2) as a pattern for the completion of the other tasks within the course and a chance for students to see how studio-based instruction might look in a totally online environ-

[72] Susan Crichton

[73] Graduate courses within the Faculty of Education at the University of Calgary are offered via campus and distance delivery (online learning). See www.ucalgary.ca/~gder

[74] Complete description and course outline are available (http://www.ucalgary.ca/~crichtos/course.html)

ment; and (3) as an opportunity for students to demonstrate their prior knowledge and skills with filmmaking.

The first purpose, an icebreaker, is critical for the development of positive learning environments (Dooley, Lindner & Dooley, 2005) and is consistent with Gagne's Nine Events of Instruction (Gagne, 1977). It supports the development of a collaborative, supportive community of practice that promotes risk-taking and social interaction (Crichton, 1998, 1993). It also provides an opportunity for students to introduce themselves and begin an authentic discourse (Wenger, n.d.) around a relevant topic — the successful completion of the course. The first assignment, a one-minute video showing "My favourite place to get a warm drink" was designed to be fun and to provide a way to begin building a sense of who the participants are in the course — a commonly cited best practice for facilitating online (Salmon, 2001). A warm drink was chosen for its universality and neutrality, as students, a mix of urban and rural, and from a variety of educational backgrounds and levels of film-making experience, were located in Hong Kong, Northwest Territories, Alberta, and Ontario.

The second purpose, a pattern, helps students to determine the rhythm of the course and its expectations. In studio-based courses, activities consist of required and elective components, and evaluation takes the form of critiques (crits). Sharing and trust within a community are essential parts of a studio environment, so a collective understanding of acceptable behaviour for constructive criticism is important. Rubrics and/or checklists, circulated in advance and negotiated during the completion of the activity promote a positive "crit" process. Patterns, as suggested by Alexander et al. (1977), help to break down complex concepts or activities into their component parts, allowing experts and novices to participate at their own levels. In the case of the icebreaker activity, pitching a story, storyboarding the actual film segments, and providing access to a final version constitute the pattern for task completion for the remainder of the course.

The third purpose, an opportunity to demonstrate prior knowledge and skills, is consistent with sound principles of adult learning (Knowles, 1995). Adults bring rich and varied life experiences to their learning. Because of this, they are capable of latitudinal as well as longitudinal learning. This means that they can encounter a new concept, link it to a previous experience, modify their understanding, and incorporate it into something new. The literature (Knowles, Holton & Swanson, 1998; Richards, Dooley & Lindner, 2004) suggests that adults come to learning highly motivated, so drawing on their need to know, prior experience, and readiness to learn is essential. Well-designed icebreakers can set that positive tone for the course, letting students experience the course expectations in a safe and supported initial activity.

Image 31.1

The following scenario is from one of the films from the icebreaker activity in the Inquiry into Digital Filmmaking course. James was from NWT. The opening sequence shows the thermometer outside his house reading minus 30°C. He fires up his Skidoo and heads out through a wooded area onto the frozen lake. He bores a hole in the ice, sets up his chair, casts his finishing line, and pulls out his small Thermos. As he pours his warm liquid into his cup, he says, "Here is where you and I enjoy a warm drink in Res Lake!"[75]

Image 31.2

[75] The text describing the video is written as an ALT Tag (Dooley et al., 2005). ALT Tag's offer descriptions of images, including the path to the actual image (e.g., "file path and name") as well as a rich, short description for those with disabilities.

While other videos included cups of tea in snowy backyards, a Starbucks in Hong Kong, a kitchen in Toronto, and a cross-country ski trip in Banff, James broke the ice on many levels. Students watched videos and then engaged in conversation within the discussion forum, asking questions about the subjects of the film and sharing technical tips or tricks, details about locations, and other details. The short films also provided a first glimpse of the students—we actually saw each other and got a taste for one another's lifestyles—something often missing in online learning.

Prior to sharing the videos, students were given some background on studio-based learning, a rubric for evaluating the films, and suggestions for how to participate in a critique of the work. Blackboard was used to organize the course, breaking the lecture content into weekly modules (course document section). The discussion board organized the 13 weeks of the course into discussion topics and hosted the film festivals for the students' work. This allowed students to annotate to their QuickTime video links as well as organize the "crit" sessions around individual videos. Additional discussion areas were created for sharing technical tips, innovations and updates in hardware and software, and solutions to common problems. By designing the course around tasks and inviting students to solve problems collaboratively, a very strong community of practice (Wenger, n.d.) formed. Hosting a video course online presented numerous problems with file size, etc., but the studio aspect allowed students to customize assignments, experience things at their own pace and skill level and engage in rich conversations concerning tasks, problems, work, and social environment. Without a doubt, video, in a studio design environment, pushes the technology of the university server, as well as that of the instructor and the students, but the design creates the type of rich online social interaction and knowledge construction rarely found in the actual practice of many online courses.

Verbalizing the continuum

The video course described above is an example of designing from the perspective of a particular instructional strategy with the intention of supporting a specific learning experience. Attempting to build an online environment to support studio-based instruction was a risk for the instructor, and a leap of faith for the students, but it worked. It was a clear departure from the typical online course design of reading content and posting comments for discussion. It clearly changed the roles for the students and the instructor, forcing both to negotiate tasks, engage in problem-solving, and participate in critiques. While studio-based design is certainly at one end of the continuum that we will discuss later in this chapter, it shares the three constants inherent in all teaching and learning interactions—the intersections of teachers, students, and content.

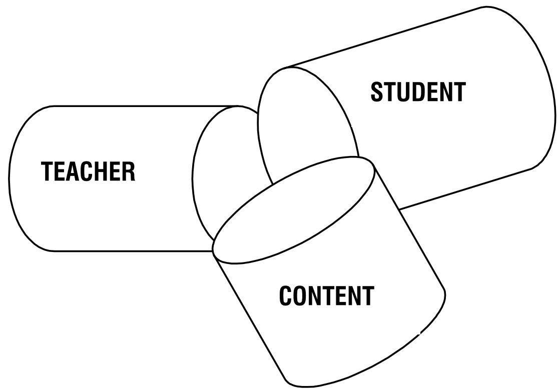


Figure 31.1. Three Constants in Teaching and Learning

We became aware of the importance of those intersections in our recent work in a Canadian International Development Agency (CIDA) project, Strengthening Capacity for Basic Education in Western China (SCBEWC). There we were called upon to introduce instructional design and develop a distance education system to train teachers in rural, remote regions. However, it wasn't until one of us was invited to lecture graduate students at Beijing Normal University on the importance of instructional design in the West that we were forced to consider the issue ourselves and share it with others in a way that ensured the key essence was not lost in translation.

The graduate students at Beijing Normal University were persistent in their demands to understand why the design rather than simply the content of the instruction is important. Figure 31.1 helped scaffold their understanding and provoked an interesting discussion concerning the overlap among the three circles. The importance of social interaction that can be generated when the teachers and learners come together to explore, solve problems, and negotiate the content was also discussed. A plate was added for the three circles to sit on, and it was labelled instructional strategy, levels of learning, and types of media. This diagram helped the students understand that it is the role of the instructional designer to select the strategy that best suits the needs and goals (Vygotsky, 1986) of the three variables (teacher, student, and content).

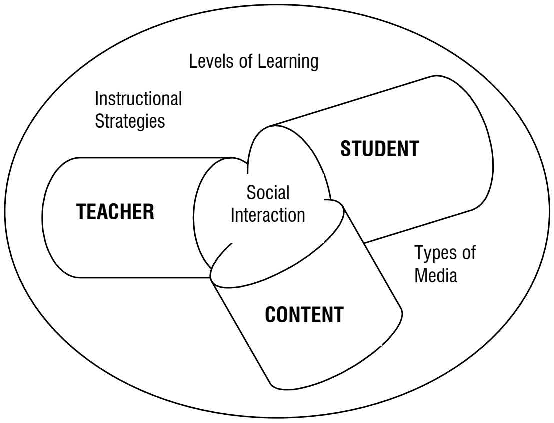


Figure 31.2. Intersection of Teacher, Student, and Content

Right there, in that simple drawing was the crystallization of the authors' thinking about social constructivism; work that draws on Dewey (1929), Piaget (2002), and Vygotsky (1986). Drawing from our experience, it was easy to share examples of a variety of educational contexts, ranging from training situations in which computer-marked drill and practice was the most appropriate approach to achieve simple certification requirements, to the development of complex simulations and scenarios to encourage higher-order thinking and problem-solving at the graduate level. Figures 1 and 2 allowed us to introduce Bloom's taxonomy[76] for levels of complexity of task design as well as Dale's Cone of Experience for appropriate media selection[77] as examples of instructional strategies and categories.[78]

Between us, we hold a combined 30-plus years of experience in instructional design, content development, online teaching and consulting; therefore, the linkage between the components of the modified Figure 1, was fairly intuitive. However, it did take the presentation in Beijing to make them tangible. Eisner (1998) is correct when he says, "There is nothing slipperier than thought …" suggesting that capturing thoughts on paper or blackboards helps to make the intangible (thoughts) tangible and therefore editable and discussable" (p. 27). We trust that sharing the figures presented in this chapter will cause you to engage in some activities that will make your thoughts tangible as well. We support Eisner's belief that it is not until people begin to capture their thinking in a sharable form (text, concept maps, collegial conversations), that it becomes concrete enough to be actionable. Our work in China has forced us to explain things in a clear and concise manner, fit for translation, that we held intuitively, and it has encouraged us to think of the diverse instructional strategies we have seen in various courses, resources and training situations and situate them along a continuum of practice. It has been through that process of sharing our individual knowledge that we have been able to solidify our thinking and enlarge our own community of practice.

THE CONTINUUM STORY

Both of us have taught instructional design at the graduate level and in workshops. We have developed content for corporate training as well as K–12 courseware. However, our work in China has forced us to synthesize how we present the importance of instructional design to others. Typically, in that work we are introducing the concept of design as a means to an end rather than a process in itself, and more often than not, doing so through a translator, with limited time allotted to the task at hand.

As we work with our Chinese colleagues to develop a system of distance education for 10 million teachers, and eventually 200 million students (China has the largest public education system in the world), the development of a continuum of practice has been helpful. To illustrate a range of increments along that continuum, we developed a table of significant approaches, matched with appropriate software, media, and instruction. Of course, any table such as Figure 31.2 generalizes important concepts and subjects those generalizations to criticism of either omission or over simplification. However our work suggests Figure 31.3 provides a helpful starting place for those considering alternative or innovative approaches to teaching and learning, especially for those new to online teaching and learning.

Stories from the continuum

The lovely thing about a continuum is that items on it are linked to represent a continuous series of possibilities that blend into each other gradually and seamlessly. Unfortunately, the physical presentation of Figure 31.3 suggests otherwise, with the rows and columns appearing fixed; the individual cells, independent and rigid.

When we reduce Figure 31.3 to its simplest form, you can begin to see the impact that the components from Figure 31.1 have on the various options. The educator, learner, and content components appear on the left side of the simplified continuum in Figure 31.4.

[76] http:///chiron.valdosta.edu/whuitt/col/cogsysts/bloom.html
[77] http://teacherworld.com/potdale.html
[78] We recognize that the use of either Bloom and Dale can prompt thoughtful debate, but they provide an initial framework for preliminary discussions with novice instructional designers.

Continuum Type	Online Instruction	Facilitated Online Instruction	Blended Instruction	Studio-based Instruction
Role of teacher / student	Teacher-prepared content Teacher-directed instruction Teacher has minimal or no direct involvement with students Need for students to participate online	Teacher-prepared content Teacher-directed instruction Interaction between teacher and students Need for both to participate face-to-face and online	Teacher-prepared content Teacher-directed instruction Increased interaction among teacher and students Opportunity for student-negotiated tasks Need for both to participate face-to-face and online	Teacher-prepared learning environment and initial problems / task Student-centred approach Active interaction between students / teachers Changed role for teacher and students
Online Approach	Asynchronous teaching / learning Learning controlled by time—fixed start / stop times	Synchronous teaching / learning options Asynchronous options Collaborative options Learning controlled by teacher	Synchronous teaching / learning Increased opportunities for asynchronous learning Opportunity for face-to-face collaboration Learning controlled by teacher	Asynchronous learning with synchronous support Collaboration Online gallery with forum for crits Learning negotiated by teacher / student
Example of software	Content managed in learning management system (LMS) such as Blackboard, D2L, Moodle, WebCT; assessment via computer-marked quizzes	Content in LMS, support via email or synchronous software (e.g., Elluminate Live, MSN Messenger); online discussions	Online discussions, LMS, synchronous conferencing Physical classroom/lab environment	Collaborative software (e.g., CMAP, shared whiteboards); simulations, VR, LMS, synchronous conferencing
Instructional strategy	Lecture / information transfer	Lecture, discussion	Lecture, discussion, task negotiation	Lecture, discussion, task negotiation, problem-solving
Evaluation	Testing / computer marked (true or false, multiple choice, short answer	Formal testing / teacher marked	Formal testing / teacher marked, potential for alternative, more open-ended assessment (essay, project, etc.)	Authentic assessment using checklists / rubrics for project assessment
Link to Bloom's Taxonomy	Knowledge level	Knowledge level Comprehension level	Knowledge level Comprehension level Application level Analysis level	Potential for all levels, including the higher-order thinking tasks of synthesis and evaluation
Role of Media[79]	Text to read Audio files (podcasts to hear) Images to watch	Text to read Audio files (podcasts to hear) Images to watch Exhibits to explore Simulations to engage with	Text to read Audio files (podcasts to hear) Images to watch Exhibits to explore Simulations to engage with Demonstrations to discuss	Potential for all media to be used Use media to dramatize personal experiences Use media as a starting point for personalized learning and individual demonstration of understanding Create own media

Figure 31.3. Continuum of Instructional Practice Typically Found in Online and Blended Learning

[79] See Dale's Cone of Experience for additional information on the relationship of media for to teaching and learning—http://teacherworld.com/potdale.html

	Online Instruction	Facilitated Instruction	Blended Instruction	Studio-based Instruction
Teacher	No / minimal interaction with student	Helps (facilitates) students with content	Brings students together (face-to-face) / facilitates online	Creates problems / task to be solved / completed
Learner	Engages with content	Engages with content with support from teacher	Engages with content with support from teacher with opportunities to collaborate with other students	Solves problems / completes tasks with guidance from teacher / other students
Content	Teacher developed	Teacher developed	Teacher developed / option for student negotiation	Teacher initiated / student negotiated
	Asynchronous	Synchronous / Asynchronous	Synchronous / Asynchronous	Asynchronous / Synchronous

Figure 31.4. Link between Figures 31.1 and 31.2

So, how can an awareness of Figure 31.4 affect teaching and learning opportunities in either online or blended contexts? In the introduction we stated that educators, as never before, have a full toolbox of instructional strategies, methods and media at their disposal. They only need awareness and opportunity to make rich and meaningful choices for their students. Teachers must recognize that software and hardware that support online learning need not dictate instruction. The needs and goals of the teachers, students and the demands of the content must do that, trusting that the technology will be flexible enough to support it.

If students need certification on a specific training issue, synchronous online instruction may be adequate, while students requiring more complex, higher-order thinking activities might need a blended learning experience. The onus is on the teacher / institution to match the learning outcomes to the instructional opportunities suggested in Figures 31.3 and 31.4, if the promise and potential of rich education environments are to be fully realized.

Online and blended learning create opportunities for remote, rural, and less-mobile learners, as well as for those in urban settings with access to both physical campuses and online options. By thinking about both the instructional strategy and the role of media, students can benefit from extraordinary multimedia-enhanced, customized learning experiences. Teachers begin to realize that they can actually offer learning content that previously would have been impossible in traditional, face-to-face classrooms.

In traditional classrooms, teachers confront the reality of a totally synchronous environment. Bells ring, class periods start and stop; instruction is reduced to chunks of time—typically less than 60 minutes. In the world of adult education and training, the reality of time and the reliance on the synchronous environment is no less apparent. The distractions may be slightly different as cell phones, laptops, and personal digital assistants (PDAs) compete with the training for the learners' attention, but the chunking of instruction is constant. Main and supporting content areas are layered around the mid-morning and afternoon breaks and sandwiched between is the ever-protected lunch break.

In both settings, as the content becomes more complex, students begin to break from the pack with some ready to move ahead and others falling behind. Tests typically occur at regular intervals, and mastery of content becomes lost in the need to cover the curriculum within a prescribed semester or school year or the workshop content before the session ends. Consequently, we see a range of grades or course completions and dropouts rather than a consistent mastery of core concepts by all students. With facilitated or blended instruction comes the potential for more flexible, asynchronous learning. Time demands change as the teacher or facilitator assists and mentors, rather than directing the instruction. The role of the content becomes important, as the student engages with it while the teacher/facilitator supports the process.

So what might the learning options presented in Figures 31.3 and 31.4 look like in actual practice? We have experienced all four options, as well as modifications and variations along the continuum, noting that rarely does learning opportunity rest solely in one type or another. In the next section we will share examples. Each of the examples was a course-based learning experience that resulted in formal evaluation and a final grade or certification. This is an important distinction, as many online training and professional development activities that use blended or fully online delivery models do not evaluate.

A story of online instruction

An example of the online course continuum type is a project for the Naval Officers Training Centre in Victoria, British Columbia, Canada. Working with their development team, our task was to create an online course for Naval Reservists to prepare them for the hands-on portion of their training. The target audience was university age, and the expectation was that they would complete the online course over the school year.

The course content itself was predetermined, but the way in which it was structured and combined with multimedia assets was up to the project design team. Due to budget constraints and the adoption of a phased approach to incorporating online learning into the Reservists suite of course offerings, online facilitation was confined in this pilot phase to ensuring access and troubleshooting technical issues. The assessment was based on a standard multiple-choice examination conducted face-to-face at Reservists locations nationally. It was essential that participants complete the course and pass the examination to participate in hands-on training. So while this example was not conducted inside a post-secondary institution, it did include a formal evaluation aspect in which grades were assigned.

Given these parameters, the design team needed to address any potential motivational issues that could affect the learning. They also designed media elements to support the learning. The resulting courseware was a mix of instructional strategies enhanced with multimedia components such as opportunities to check progress and learning, short video clips of on-ship procedures, audio files of past course participants and instructors, scenarios and case studies depicted via video or still images, matching games, etc.

The resulting courseware provided the students with flexible access to multimedia-enhanced content in an organized, predetermined manner and allowed the teacher to use the limited face-to-face time for other content considerations.

A story of facilitated instruction

EDER 673—Introduction to Instructional Design—was designed in response to my experiences as an instructor teaching an audio version of the same course. The course participants were all part of a M.Ed. program and came from a wide range of backgrounds including post-secondary, K–12 and corporate education with an average age of 40. As teachers/trainers, many already thought of themselves as instructional designers and had a difficult time relating to the language and practices of the instructional design field. However, as they progressed through the course, all found that. in practice, they were using the same techniques and approaches as those featured in the course, just under another title.

Upon reflection, and influenced by Donald Schon's book *The Reflective Practitioner* (1983), I realized one of the problems with the structure of the audio course was lack of acknowledgment of teachers' experience as designers. I was trying to present a different view of instructional design, not their first view. For this reason, the online course of EDER 673 focused on the exploration of curriculum ideologies, the development of their own personal views of teaching and learning, an analysis of different texts and the incorporation of some of these ideas into each student's personal instructional design model. Given this approach, it was my hope that the students would not dismiss instructional design theory, just as the instructor was not dismissing their experience as teachers and designers of their own instruction.

The online version of EDER 673 was designed around the following assumptions:

- The "meat" of the course lies in the online discussions and related activities. As a result, there were very few content pages to scroll through, but rather pointers to articles and activities to do for each week's discussion forum.

  This design approach was based on my experience that it is through reading, reflecting and conversing with others that one gains a better sense of the complexities of instructional design (ID). From there, participants really need a space and place to share ideas with others and to contemplate how the course concepts might work in their unique setting.
- An ID course has to be application-focused. There is a certain amount of how-to that comes with learning the language and process of ID, but at some point folks need to get their hands dirty and use the tools of ID in their own unique settings.
- Learning ID should be fun. I have been working and teaching online for eight years and, if there is one thing that technology has reinforced, it is the need to have patience and a sense of humour!

Based on these assumptions and the constraints of the online environment, LMS structure and organizational requirements, I then began to structure the course and in essence the learning space for the participants—predetermined, in keeping with Figure 31.2. I knew that when dealing with messy and complicated concepts it is necessary to be able to see how they relate to the larger picture, as well as to real-life situations in a variety of settings. For this reason, I chose to use an adventure metaphor to represent the introductory travels through the field of ID and its associated methods and techniques. As with all adventures, there is no linear path to success. In instructional design there is no systematic method for applying one technique at one time and then moving forward. The reality is that we use all of the techniques and models in a complex, ever-changing environment.

ONLINE COURSE STRUCTURE

The online version of EDER 673 was designed around units to be completed each week in order to give people time off on the weekends for reading, contemplating and reflecting. In order to be able to participate in the online activities and discussion required for each, the participants had to complete the readings prior to beginning of the week's unit.

In the course documents section of the LMS, the unit for each week built on:

- a preamble introducing the topic and its relevance
- a backgrounder explaining the rationale behind the readings selections
- a variety of activities to be completed as part of participating in the discussion forum for the week

In order to keep the discussion forums manageable, they were set up so that there was one discussion forum per week of the course. Participants were responsible for participating in 10 of the 13 discussion groups. Forums for each assignment were also set up so that questions relating to the assignments could be dealt with in their respective forum, where all participants could learn from the dialogue.

The course also included scheduled, synchronous online discussions using Elluminate technology at three times during the course. These discussions provided an opportunity to touch base and see how all are doing, clarify assignment requirements and host guest speakers in various topic areas relevant to the course content. These sessions were all recorded and archived for review in case participants were unable to join in at the scheduled day and time.

My role, after the course had been designed and posted to the LMS, was that of facilitator. I was actively involved in the discussions while at the same time creating space for participants to discuss and sort through their developing understandings of ID—a tricky balance. I tended to be more heavily involved in leading the discussions during the first few weeks of the course and then gradually moved into a participatory role as I attempted to build and foster a discussion space and culture that valued all contributions as we developed our shared understandings of the content and topics. My turnaround time for assignments was one week. For discussion postings or emails, it was 48 hours at the latest, but more often was within the same day. Virtual office hours were twice a week—although rarely used—and the synchronous sessions were well attended, as I tried to get guest speakers that were in keeping with both the topic area as well as the undercurrent of discussion at that time.

The course centred around two assignments prepared in three phases each: 1) the creation of an instructional blueprint for a piece of instruction, and 2) the development of an original instructional design model based on the characteristics and constraints of participants' work environments.

Course feedback has been consistently positive over the past eight offerings. A common comment is that students really appreciate the overall structure of the course and the flow of the weeks. The final assignment, developing their own model of instructional design, gets rave reviews each time. One participant in particular used her final assignment to outline her approach to instructional design in an interview within her school district, and she was the successful candidate for the position of Assistant Principal—Online Learning. For me, the take away from this experience was that in this case, with this audience and the content being covered, a facilitated instruction approach was effective.

A story of blended instruction

Typically described as an instructional strategy that incorporates the best of face-to-face learning and online content and discussion groups, blended instruction often meets with mixed success. A key challenge to designing blended learning strategies is to sort out what content is best suited to which format—online or face-to-face. If that decision is not well considered at the design level, the workload for both the teacher and students may seem overwhelming, and the learning experience may be inconsistent with the curricular goals.

In blended learning, typically the face-to-face component is supported by supplementary online content. This is usually contained within an LMS, often with asynchronous discussion groups and synchronous sessions, and it may take the form of blogs, podcasts and multimedia simulations. Conversely, a blended course might exist primarily online, with a few face-to-face meetings for more experiential learning opportunities such as labs, visits to specific sites, or face-to-face orientation sessions so students can meet each other and the instructor.

In winter of 2004 I had the opportunity to design a campus-based course for pre-service teachers. It was entitled Distributed Learning: Teaching and Learning Online. The desire to build and teach this course came directly from my personal experience as a K–12 online educator, as well as my research into the practices of K–12 online teachers. I felt the course had to model excellent practice and leverage emerging technologies, as it would introduce blended and online learning to pre-service teachers.

The course, an elective, met on Friday mornings for three hours, and it was assumed that students would work an additional three hours per week independently. Further, all similar electives within the program,[80] required students to complete an inquiry paper based on action research.

Before the semester started, I met with the students and determined that none of them had taken an online course before. The majority had very limited technology skills and were actually enrolled in the course to gain them. Therefore, I started the design of the course by considering the amount of time available (13 weeks) and listing the learning experiences that I wanted the students to have; I then organized the content to fit those constraints. I sorted the content into experiences that I felt were best shared, either face-to-face during the Friday sessions or online during the expected independent study time. Further, I modified the inquiry paper to include the development of a student-negotiated learning object.[81] I planned for the final face-to-face class to be a celebration of learning where the students could share their learning objects and talk about their successes and challenges. Therefore, I was left with 11 sessions to present content, develop technology skills, and model more student-centred approaches to learning.

Assuming the first session and the last were orientation, introduction and celebration, respectively, I distributed specific content to each of the other 11 sessions, covering topics such as roles and responsibilities for online educators, content development, issues of pedagogy and assessment, characteristics of asynchronous and synchronous learning, global issues—digital divide, employment opportunities, and universal design. Paralleling each topic were weekly online content structured within the LMS and opportunities for students to practise moderating the discussion forum. The face-to-face sessions became workshop opportunities, with matching software complementing the various topics. For example, the week on content development was supported by concept mapping using Inspiration software for storyboarding and an introductory, hands-on session in digital filmmaking.

The most critical design decision on my part was where on the continuum (Figure 31.3) I should start. As our program is inquiry-based, I felt it would have been inappropriate to start with online instruction only. Further, because there was an existing face-to-face expectation, the facilitated online instruction model would not work either. The choice rested with a blended approach or a studio-based approach, and I chose blended, designing the face-to-face sessions as a studio-based model in terms of the hands-on learning and open critiques of the products and process.

This course has been offered each year since its introduction in 2004,[82] and students have been hired directly from the course for jobs in online teaching for the local school board. Each year, the course content has changed as new technology emerges. In the last offering, I included podcasting, wikis, and blogs, and I am still exploring options for the upcoming course. The course has exceeded my expectations, and the evaluations have been excellent.

During the first offering, a graduate student (Shervey, 2005) researched this course for her thesis. The study was positive and reaffirming, as it revealed that the students' perceptions of promise and potential of online learning changed as they experienced them firsthand.

Blended learning worked well for the Distributed Learning course. For example, it allowed me to share asynchronous technologies during the sessions on asynchronous and synchronous learning. Rather than attend class, I encouraged the students to connect from home during the Friday class, letting them experience what it felt like to be learning along from home. One of the

[80] The teacher preparation program at the University of Calgary consists of four semesters over two years. In the fourth semester, students can select an elective along with the three required courses. The blended course described in this paper was an elective option. For details about the general program, please see http://www.educ.ucalgary.ca/dtp/index.html

[81] The goal of the learning object (LO) project was to encourage students to think about a curriculum concept they had struggled to teach during their in-depth practicum. The LO was to be a multimedia tool that presented the content asynchronously. I knew they would need all the skills presented in the face-to-face workshops to complete their LOs, but I didn't state that explicitly.

[82] In two of three offerings the students nominated me for a Teaching Excellence award. I mention this only as the rationale for each nomination was the innovative course design and the excellent modelling of blended learning.

most successful sessions was the discussion of employment. I invited colleagues who work in various online professions to join the discussion forum. I created a forum topic for each of them, introducing them to the course and explaining to the students how I knew them or had worked with them, thereby personalizing these potentially anonymous guests. Each guest then posted a description of their work and invited the students to ask questions. And question they did, asking everything from who are you, to how much do you make, and are you lonely sitting at home.

Over the three offerings of this course, I have done little to change the structure or my instructional strategies, which appear to be working well, but the design is flexible enough to allow me to change the content as new things emerge. I cannot imagine offering this course in anything other than a blended approach, as I have learned that our face-to-face time is as important as our online time.

A story of studio-based instruction

The story of studio-based instruction (SBI) was introduced at the beginning of this chapter.[83] In this section, we'll place that story within the framework provided by Figure 31.3. SBI requires teachers to think differently about course structures. In other online graduate courses, I had simply taken the number of weeks available, subtracted two for start-up and conclusion, and plotted the topics to be covered over the remaining 11 weeks of a 13-week semester. In my previous online courses, I situated three activities, each increasingly complex, over the 13 weeks, and planned two synchronous class meetings for students to share their second and third assignments. Content, in the form of text lectures, was placed in the course document area, and a discussion forum was created to correspond with each lecture. Students were expected to read the content, post comments, and negotiate the assignments. I designed a format for the content lectures, so students could expect to see the same pattern presented each week. This approach received excellent reviews. The format included sections for my presentation of content, student tasks, suggested resources, and a to-do list. However, I also received criticism because the course was so tightly designed, and the activities were so varied that students felt they had covered the content broadly but not deeply.

Criticism from my previous courses, about breadth rather than depth, informed my decision to try SBI. While I still had the 13-week semester as a constraint, I decided that Inquiry Into Digital Filmmaking—EDER 675.15 was not going to be a sampler of filmmaking techniques; rather, it would be an inquiry into the potential of digital filmmaking in research techniques, content development, DVD production, and digital literacy. At the graduate level, the course could not be a how-to workshop for filmmaking, so students needed the opportunity to either (1) demonstrate their existing skills and prior knowledge through digital filmmaking, or (2) gain those skills quickly enough to begin to use them in the course. As digital filmmaking and editing were relatively new, I also did not want to penalize students who did not have regular access to editing software or digital video cameras. Therefore, I needed to create a variety of tasks such as creation of simple films, development of DVDs or completion of research papers on related topics.

Mindful of the need to design a learning environment that supported a rich understanding of the potential of film, while allowing students to gain a deeper experience, I turned to SBI, breaking the course into three required components. The first component was designed according to adult learning principles. It asked students to provide evidence of 30 hours of concentrated inquiry into the knowledge and skills of basic filmmaking, asking them to either attend a workshop on digital filmmaking,[84] or work through the textbook *The Director in the Classroom*, or explain how their previous experience was equivalent to the 30 hours of inquiry into digital filmmaking. To demonstrate their understanding of Component 1, students had to share their one-minute video described in the ice-breaker activity in the Studio Story section of this chapter. It was suggested that students complete Component 1 within the first four weeks of the semester.

Component 2 consisted of four modules of which students were to select two. A few students negotiated for the two to be merged into one larger component, and some students chose to work collaboratively. Details of the modules are available online.

[83] An interesting description of studio-based learning can be found at http://schoolstudio.engr.wisc.edu/studiobasedlearning.html

[84] British Columbia filmmaker, Nikos Theodosakis, developed a workshop and textbook entitled The Director in the Classroom. He offers a constructivist approach to introducing digital filmmaking in the K–12 classroom (http://www.thedirectorintheclassroom.com)

Component 3 required students to participate in the online discussion forum in Blackboard throughout the semester. Because the students would be working asynchronously on their projects for the various components, I felt the discussion forum would create a space for the development of a community where we could come together and discuss the various modules. This would allow students who were not doing a particular module to begin to understand what it was generally about and engage in conversation related to it. Discussion forums introduced topics the first week and then elaborated on them in the second. The final week was an online film festival, with invited guests offering their criticism and suggestions.

Essential to SBI was the notion of a class critique, or crit. The crit provides an opportunity for sharing, feedback, constructive criticism, and interaction. Crits help build community and social interaction, and the concept of the crit, as well as roles and responsibilities, was clearly laid out before the first one occurred at the end of Component 1.

My role was to design the learning environment, including the content for the modules and the tasks for each of the three components, and to support subsequent learning. Immediately, students had to take an active role, negotiating their learning and deciding which modules to complete. Many found this challenging, as it was beyond their previous experiences with online learning. Only two students had ever taken a studio-based course before. These two students quickly became class leaders. SBI learning allowed the students to work independently and asynchronously. I supported them via regular email, and they connected with their classmates through the forum during the week. I arranged for two synchronous, Elluminate *Live*! sessions, one early in the semester to clarify course expectations, and one later in the semester to share final assignments for Component 2.

The course design was an absolute success. Course evaluations were glowing. Students were appreciative of the chance to experience an instructional module different from more typical facilitated or blended instruction. As well, the content of both the written work and the digital videos was excellent. The course did require technical support, as those students working in the Windows environment struggled to edit their videos and export their final products to QuickTime format. The Macintosh users had a much easier time using proprietary software available only for that platform. Fortunately, bandwidth was not a concern, and the three students who created DVDs as part of their Component 2 option had to mail actual DVDs of their work, as the file sizes were too large regardless of their locations.

I would offer this course again, using the SBI approach. However, I did learn two major lessons. The first was that students found it hard to adjust to the radical changes in course design inherent in SBI. They were initially reluctant to be proactive and negotiate tasks. In subsequent discussions about the course, a number of the students suggested that their initial concerns were exacerbated by being online and not having the initial trust that they could make the course work for them. Further, they stated that they were not sure if they could communicate openly and freely with an instructor they didn't know, suggesting they would have known be better if we had met face-to-face first. Therefore, it will be incumbent on me to consider an additional icebreaker, in advance of Component 1, to begin the process of community building in the hopes of supporting greater risk-taking sooner in the limited time available.

The second lesson I learned was the need to stay with a proven pattern for content presentation. Instead of using the format I had developed for text lectures, I shifted to a series of hyperlinked web files. That format confused the students, did not create a pattern for content expectations across the modules, and added an unnecessary level of complexity. Consequently, I will need to revise the content portion of the synchronous modules to address this shortcoming. The greatest irony in this is that one of my colleagues used my hyperlinked Web file format in a course that one of my filmmaking students had taken, and the student suggested I might want to try my colleague's format as it was so effective!

Studio-based instruction is at one end of our continuum, as it is the greatest departure from the original correspondence-based distance education. It requires active learning on the part of the students, and it forces teachers into the role of facilitators. It requires innovation and flexibility on the part of educators, as well as a rich understanding of media and software to support an authentic crit process. Further, because the curriculum is negotiated, and therefore student-centred, self-paced, and individualized, it requires a great deal of subject-matter expertise from course facilitators. There are no answer keys or computer-marked quizzes in this format!

Summary

One of the greatest lessons we have learned over our many years of teaching and learning in and about online and blended contexts is that educators have a range of choices concerning their instructional strategies. While the three constant factors presented in Figure 31.1 (teachers, learners and content) remain, and should influence teachers' choices, the degree and purpose of social interaction changes, depending upon the design of the instruction. Consequently, it becomes the job of educators to select instructional strategies and media to support them, and then make the technology itself disappear so that learning can occur. As seen in the four stories illustrating our continuum, the teacher must push back on the technology and not be dictated by it. Online and blended learning is not about technology; it is about learning. The technology must become transparent and ubiquitous to learners, and part of the role of educators and course designers is to ensure that occurs.

Having students and teachers alike reading lectures or listening to yet another podcast or video clip can no longer be considered a new or provocative way to teach as we begin the 21st century. We have more tools and technologies at our disposal than ever before, but we are still limited in how we conceive using these tools in our practice.

As educators, wrestling with myriad digital technologies, we must remember that our students have computers on their desktops that are many times more powerful than those that initially put astronauts on the moon. Therefore, are we really going to ask them do the ordinary things when they are poised for and capable of the extraordinary? Will online learning continue to be a poorer option to classroom learning, or are we prepared offer richer learning opportunities than are available in the majority of traditional classrooms? Is our nervousness about technology stifling our creativity? Until we understand our options, and begin to make informed decisions about instructional strategies and the media that might support them, we fear the promise and potential of learning online will continue to be lost.

We realize that it is our task to make the technology disappear for the learners and allow it to become an ordinary part of the teaching and learning environment. When we consider the rich learning opportunities created in the studio-based example shared in this chapter, we realize what is possible. What we don't know is what will be possible in the future. However, we do know that all that is limiting us is our willingness to push the limits.

CLOSING QUESTIONS TO PONDER

What can you accept as indicators of success for the various instructional strategies suggested in Figures 31.2 and 31.3?

As multimedia is added to courses, how does the teacher ensure the content is not lost in the process? How can the media and technological frameworks be made to disappear and only support the learning?

Assuming the continuum of practice is an effective way to discuss online options, what might we expect the next extensions of the continuum to look like?

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