

# Education for a Digital World

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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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# Contents

Chapter Abstracts / v

Introduction / 1

## **Part 1: The Impact of Instructional Technologies / 3**

- 1 Emerging Technologies in E-learning / 5  
*Patricia Delich, Kevin Kelly, and Don McIntosh*
- 2 Virtual Design Studios: Solving Learning Problems in Developing Countries / 23  
*Kris Kumar*
- 3 Challenges Confronted and Lessons (Un)Learned: Linking Students from the University of Ghana and Kwantlen University College / 31  
*Charles Quist-Adade*
- 4 Addressing Diversity in Design of Online Courses / 41  
*Madhumita Bhattacharya and Maggie Hartnett*
- 5 Mobile Learning in Developing Countries: Present Realities and Future Possibilities / 51  
*Ken Banks*
- 6 The Impact of Technology on Education / 57  
*Mohamed Ally*

## **Part 2: Preparing Online Courses / 67**

- 7 Learning Management Systems / 69  
*Don McIntosh*
- 8 Exploring Open Source for Educators: We're Not in Kansas Anymore – Entering OS / 95  
*Julia Hengstler*
- 9 Quality Assurance by Design / 111  
*Niki Lambropoulos*
- 10 General Principles of Instructional Design / 131  
*Peter Fenrich*
- 11 Accessibility and Universal Design / 143  
*Natasha Boskic, Kirsten Starcher, Kevin Kelly, and Nathan Hapke*
- 12 Articulation and Transfer of Online Courses / 181  
*Finola Finlay*
- 13 Planning Your Online Course / 191  
*June Kaminski and Sylvia Currie*
- 14 Assessment and Evaluation / 213  
*Dan O'Reilly and Kevin Kelly*

**Part 3: Implementing Technology / 245**

- 15 Understanding Copyright: Knowing Your Rights and Knowing When You're Right / 247  
*Dan McGuire*
- 16 'Open Licences' of Copyright for Authors, Educators, and Librarians / 255  
*Julien Hofman and Paul West*
- 17 E-learning Standards / 267  
*Randy LaBonte*
- 18 Leadership and E-learning: Change Processes for Implementing Educational Technologies / 277  
*Randy LaBonte*
- 19 Building Communities of Practice / 287  
*Shawn Berney*

**Part 4: E-learning in Action / 307**

- 20 Instructional Strategies / 309  
*Peter Fenrich*
- 21 Media Selection / 321  
*Peter Fenrich*
- 22 Computer-Based Resources for Learning / 341  
*Peter Fenrich*
- 23 Computer-Based Games for Learning / 353  
*Alice Ireland and David Kaufman*
- 24 Evaluating and Improving Your Online Teaching Effectiveness / 365  
*Kevin Kelly*

**Part 5: Engagement and Communication / 379**

- 25 Tools for Online Engagement and Communication / 381  
*Richard S. Lavin, Paul A. Beaufait, and Joseph Tomei*
- 26 Techno Expression / 413  
*Kevin Kelly and Ruth Cox*
- 27 Social Media for Adult Online Learners and Educators / 429  
*Maira Hunter*
- 28 Online Collaboration: An Overview / 441  
*Paul A. Beaufait, Richard S. Lavin, and Joseph Tomei*
- 29 Identity in Online Education / 461  
*Joseph Tomei, Paul A. Beaufait, and Richard S. Lavin*
- 30 Supporting E-learning through Communities of Practice / 475  
*David Kaufman, Kevin Kelly, and Alice Ireland*
- 31 Looking Forward: Stories of Practice / 489  
*Susan Crichton and Elizabeth Childs*
- Contributors / 503

# Chapter Abstracts

## 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, tech-

nologies 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 ob-

jects. 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-around 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

*Maira 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 collabo-

ration 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 time-frame.



# 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).<sup>1</sup> 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-

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<sup>1</sup> 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.”<sup>2</sup>

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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<sup>2</sup> 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](http://www.col.org/pcf2/papers%5Chiggins_1.pdf)

*Part 1:*  
*The Impact of Instructional*  
*Technologies*



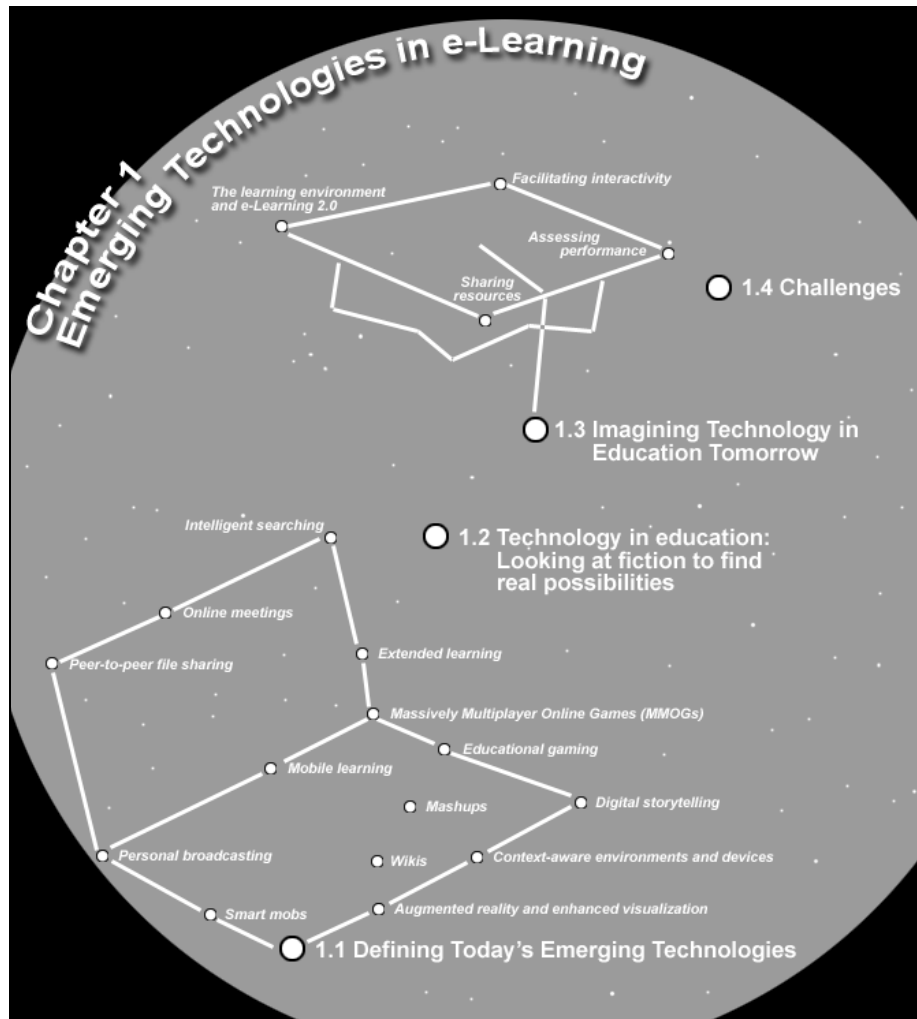


# 1

## *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 **blogs, 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 that 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), **vlogs** (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](http://wordpress.com) for blogs or [youtube.com](http://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 edu-

cational 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 **APIs** 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 possibly 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 (tvoover.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](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 soft-

ware 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, Friebs, 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 en-

able 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 incorpo-

rate 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](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 crea-

tor 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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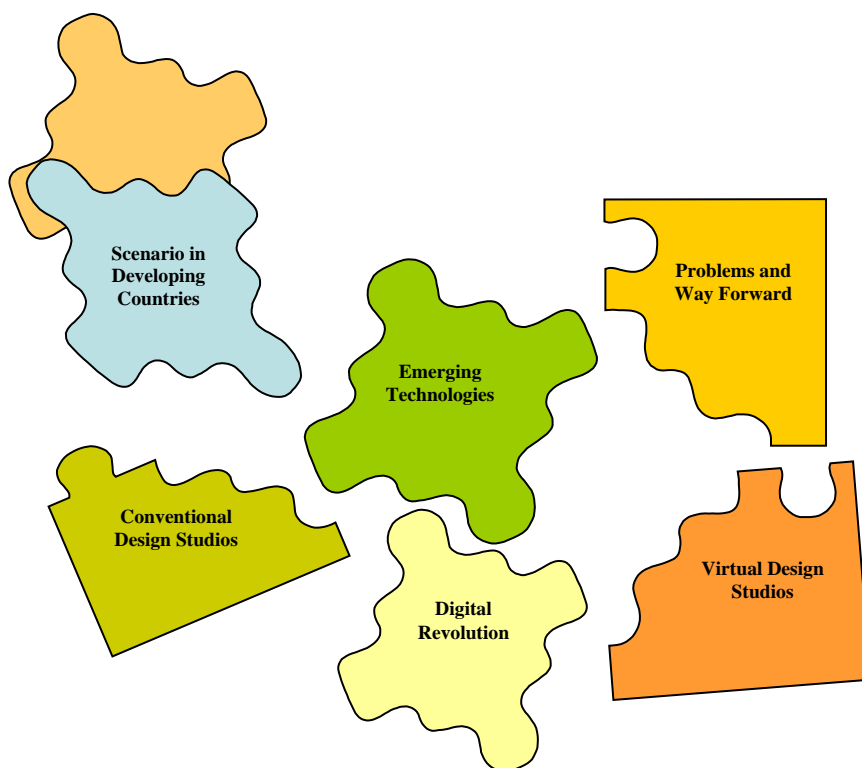
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# 2

## *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.

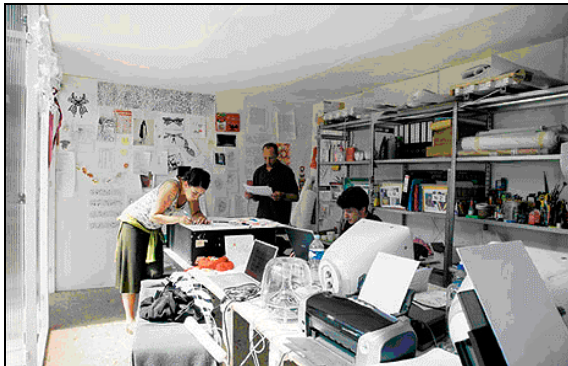


Figure 2.3 Boontje Design Studio France



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

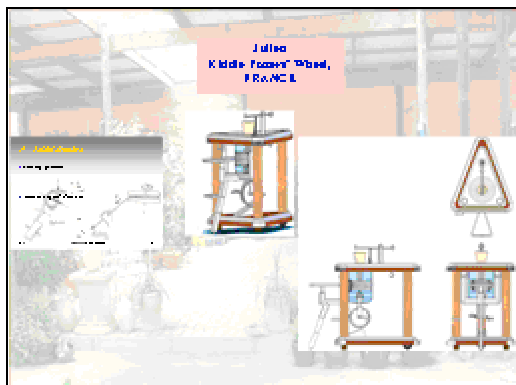


Figure 2.6 Design details contributed by Julien on the Potters' Wheel from France

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 are 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 <sup>a</sup> 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.

<sup>a</sup> Aytayo, 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.

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- <http://images.jupiterimages.com/common/detail/21/07/22620721.jpg>
- [http://mocoloco.com/tord\\_boontje\\_studio\\_france.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.ridestory.com/files/acura_design_studio1.jpg)
- <http://www.ceo.wa.edu.au/home/carey.peter/vc.jpg>
- <http://www.ivci.com/images/polycom-hdx-4000-photo-2.jpg>

## Resources

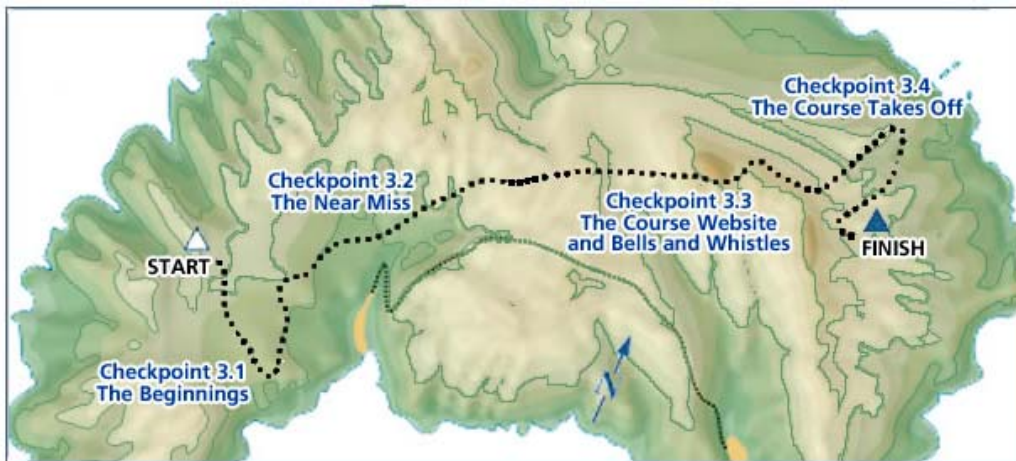
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# 3

## *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 there 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.<sup>3</sup> 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 materi-

als, 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.

<sup>3</sup> 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 reusable 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 video-conferencing 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 Illuminate 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 that 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<sup>4</sup> 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"

<sup>4</sup> 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](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 a 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<sup>5</sup>

**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 GLOBAL 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.<sup>6</sup> 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.

<sup>5</sup> These assignments were adapted from Professor Derrick Cogburn’s seminar course on Globalization and Information Society.

<sup>6</sup> 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 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 Microsoft 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 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

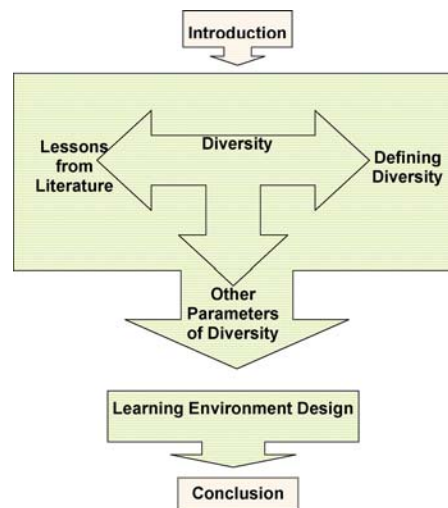
## *Addressing Diversity in Design of Online Courses*

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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 increas-

ingly 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	<ul style="list-style-type: none"> <li>• direct</li> <li>• emphasizes content and clarity</li> <li>• frequent use of “I”</li> </ul>	<ul style="list-style-type: none"> <li>• message is indirect and reliant on hints, eyes bodies, etc.</li> <li>• emphasizes context and concern for feelings and face-saving</li> <li>• frequent use of “we”</li> </ul>
Conflict resolution	more direct	obliging, avoiding, integrating, & compromising styles
Morality	prefer attitudes and behaviour are consistent	<ul style="list-style-type: none"> <li>• contextual and focused on welfare of the collective</li> <li>• linked to adherence of many rules</li> </ul>
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 cul-

tural 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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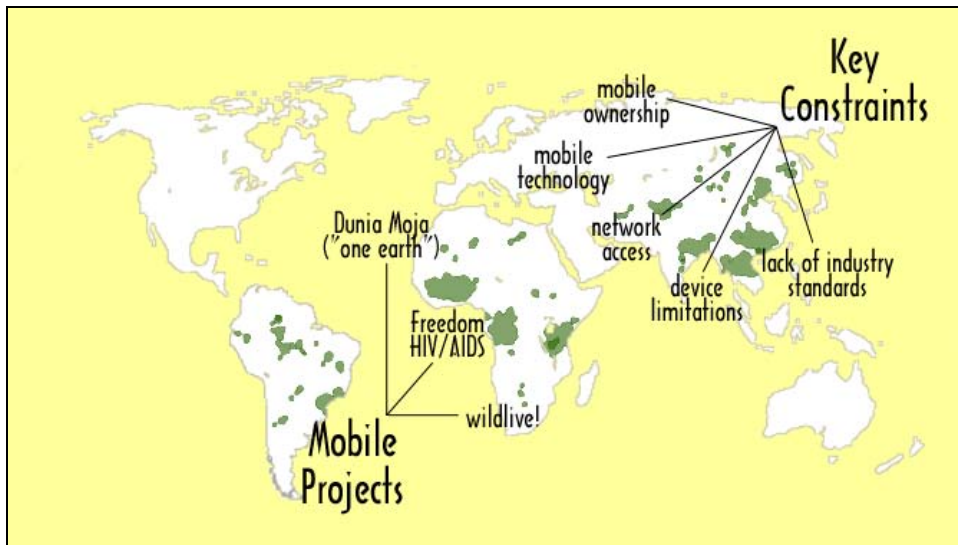
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# 5

## *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](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](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](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 proj-

ects 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 coun-

tries. 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

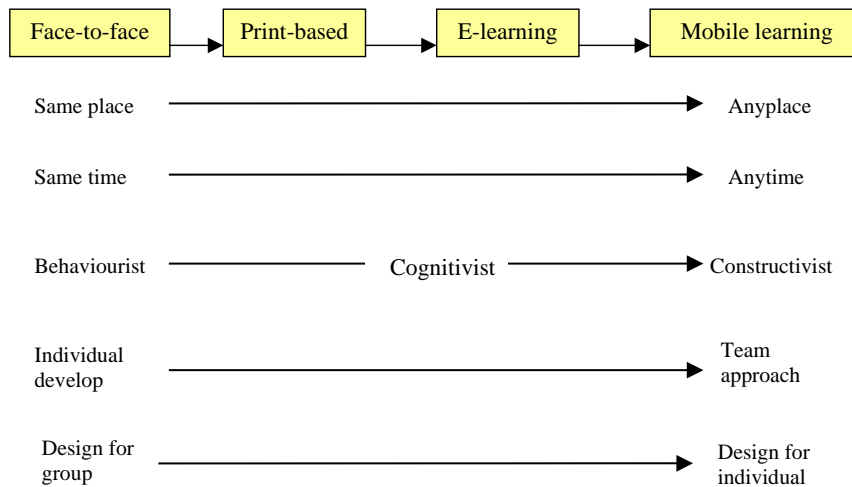
Mohamed Ally  
Athabasca University

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

Impact of technology on education

History of instructional technology

Emerging technologies in e-learning



## 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 mini-computers to teach. With the invention of the micro-computer 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 micro-computer in the 1970s, there was a shift to micro-computer-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 scalable, 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.

There 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 **meta-cognitive** skills during the learning process. Meta-cognition 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 then 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.

### TIPS AND GUIDELINES

- Involve key players from 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.

### TIPS AND GUIDELINES

- 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.

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 be delivered by newer technologies.

“Real learning occurs when learners learn by doing and making things”. – Ally

## 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

## 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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