1 Introduction

MISSION CRITICAL

e-Learning is unquestionably the major 'mission critical' in education systems the world over, and is likely to remain so for the foreseeable future. There are many reasons for it being so much in vogue, not least the globalization of commerce and citizenship, and the burgeoning of information and knowledge available on the Internet. The recognition that today's economies need to be knowledge based, which in turn require a workforce and consumer body that are characterized by flexibility, independence in learning and information and communications technologies competence, may be an even more compelling reason for governments to be as proactive as they are. As a means to increase access to learning – anytime and anywhere – the ensuing interest in e-Learning is nothing short of phenomenal, with the result that authoritative texts are in growing demand. No one could claim to offer a text that would be definitive in such a fast-moving environment but we offer *e-Learning: Concepts and Practice* as an all-round but sophisticated entrée to the power and potential of e-Learning, and the main approaches to delivering it. We draw on a wide variety of globally dispersed examples and, in order to help understand why it is in the form we currently know it, we also provide a potted history to chart e-Learning's evolution from its antecedents in programmed learning. The text should therefore prove of interest to the general reader and to students, academics and professionals working in the field of educational computing.

The twin goals of the book are to provide an overview of existing e-Learning approaches and a vision of the future. We specifically look at

ways that e-Learning will optimize teaching and learning for academic researchers, trainers and educators, World Wide Web (Web) developers, resource content managers and those who have a general interest in e-Learning. The intention is to enhance understanding of the potential of e-Learning by covering all its important aspects in ways that explore, through practical examples, the implications of its use. The insights gained will act as a foundation for further exploration.

Each of the nine chapters explores a different feature associated with e-Learning, from learning enrichment to lifelong learning. The sequence of chapters is laid out in a manner that takes the reader from the more simple concepts of how to provide enrichment in the learning process to the more complex issues involved in building a community of learners. Promoting the knowledge these learners develop in turn creates a self-sustaining learning community.

A FRAMEWORK OF PRACTICE

Traditional books are arguably not an adequate vehicle for dealing with e-Learning in that the printed page has considerable limitations when it comes to illustrating its interactional features and power. The design of *e-Learning: Concepts and Practice* therefore allows for the main text of each chapter to address the concepts involved, while a variety of 'break-out boxes' provides readers with opportunities to look more practically at aspects of e-Learning through carefully chosen websites and online activities.

e-Learning requires different types of engagement, categorized in the framework of key practices or skills illustrated in the petals of the e-learning 'flower' in Figure 1.1. Note that the radial nature of the flower petals imply that there is no hierarchy in this framework. In any one instance, the practical activity undertaken by the learner may involve only one or perhaps several of the actions or skills denoted in the figure. While it might be possible to suggest levels of complexity to associate with the elements of this framework, it is likely that such a consideration will be irrelevant. It will be the actual context and the learner's needs and aspirations that will determine which practice or skill is appropriate.

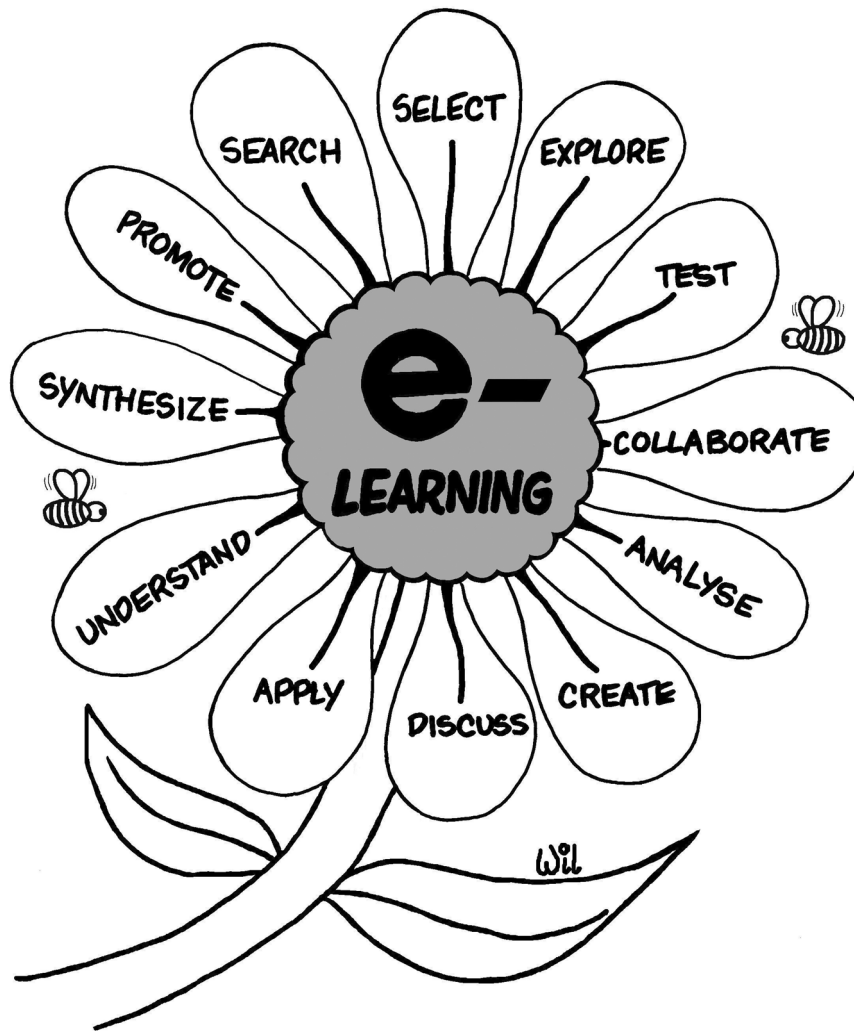A brief outline of these key practices is provided below.

Figure 1.1   A flower petal framework (non-hierachical) for e-Learning practices and skills

Searching and selecting

Usually in some combination, search and select activities are the 'bread and butter' of learners' collation of information; the one identifying where the sources of information might be (searching), the other choosing the most relevant sources according to the criteria established by their learning

needs (selection). For example, the reader in Box 1.1 is asked to go the Massachusetts Institute of Technology's OpenCourseware site to search out and select specific academic materials from a wide range of resources for different subject areas. The final selection is made on the basis of the value of the courseware for their own purposes.

🖰 **Box 1.1**

Visit the Massachusetts Institute of Technology's OpenCourseware site at http://ocw.mit.edu/index.html and search for information on the poet John Donne. Select anything that would help you to develop your knowledge of the nature of English poetry in the sixteenth and seventeenth centuries. Do not worry if you have no interest in poetry – just try the exercise for fun.

Saving and keeping track of the information, and any new knowledge, are skills that will be challenged persistently by the sheer volume of material available. Bookmarking or saving favourite websites will make it easier to conduct subsequent searches, but personal annotated databases will be increasingly needed to hold all relevant electronic sources. There was a time when each family was lucky to have a few texts or perhaps only a Bible; today in the developed world we are literally drowning in information! The skills of criterion-searching and selecting by relevance are staples in the set of basic Internet literacy tools.

Exploring

Similar to searching, exploring implies a more relaxed browsing, looking for information that might match our interests or meet our needs. It is an almost everyday activity, as we scan a magazine or newspaper, for example, for items that interest us. As with searching, it is based on a set of criteria but more loosely than the specific search criterion ('information on John Donne') illustrated in Box 1.1.

Testing

Related to exploring is the discovery mode of e-Learning, in which learners try out ideas, test hypotheses, and so on. Web-based information comes in many forms and simulations, and games are examples in which the full potential of interactive engagement is used. Rather than simply reading new information, such activities enable the learner to avail him or herself of a type of information-cum-knowledge creation that requires them to explore and manipulate virtual circumstances and conditions relevant to the focus of their studies. For example, students of chemistry may test models of complex molecules or they may conduct virtual experiments. Social science students may model voting patterns or the factors affecting levels of poverty in specific regions. All such work proceeds in an e-Learning context without the burdens of expensive resources, real-time practicalities and, even, dangers that the real conditions might impose. The very act of 'doing' the work allows the learner to create and assimilate new knowledge. Have a go at Box 1.2!

🖱 **Box 1.2**

Visit http://www.colorado.edu/physics/phet/simulations-base.html, which is a physics education site hosted by the University of Colorado. Use the Sound simulation to explore and test how sound is heard by a listener when the source experiences air pressure changes.

Analyse and synthesize

These activities often go together as learners deconstruct the complexity of a set of information (analyse) and rebuild it as their own knowledge (synthesize). When we analyse a set of information, be it train timetables or quotations for holiday insurance for example, we attempt to reduce it to different categories, distinguished by the importance we attach to each of them. Once we have looked at several versions of the information, the risks covered by each of several insurance policy proposals for example, we

begin to synthesize it to make sure that what we eventually choose fits our needs and at a competitive cost within the options we have. Learning is no different. Whatever the context, the analysis of relevant information from different case studies, examples of scientific phenomena, periods of architecture or whatever, and the synthesis or pulling together of this information to suit our specific learning needs, are key learning skills necessary not only for constructing the new knowledge for ourselves, but for beginning to contribute new understandings for others. Have a look at the exercise in Box 1.3 – but do not worry, it is only an example and we do not expect you to complete the exercise!

⌂ Box 1.3

Check out the website of the Early Childhood Research and Practice online journal at http://ecrp.uiuc.edu/, and search through to find the following papers:

- The Llama Project (Ganzel and Stuglik, vol. 5, no. 2);
- The Lunch Project (Floerchinger, vol. 7, no. 1);
- The Construction Project (Berry and Allen, vol. 4, no. 1).

What are the common features of these project reports (Analyse) and what implications do they have for developing good practice in early years education (Synthesize)?

While the first six learning practices above assist learners to assimilate 'new knowledge and understanding', the next six exhort them to follow through, consolidate, share and use their knowledge gains.

Collaborate and discuss

The cycle might begin with the learners seeking to share the information and new knowledge with others (collaboration and discussion); a process that is well known to consolidate and improve understanding through the action of being obliged to explain (externalize) what has begun to be

internalized. Very often we tell others about something we have read and a discussion ensues. One of the most powerful factors in promoting learning is this contribution to discussion and collaboration with others who are working towards the same goal. By articulating the ideas to others and hearing their inputs, by repeating them and teasing out the implications of theories or sets of conditions, such discussion will assist in formulating and consolidating new knowledge. In this way, connected learners can move each other beyond the level of superficial understandings.

Understand and apply

During this consolidation and sharing phase, it is likely that the learners will be faced with the challenges (or opportunities) to demonstrate their grasp of the new knowledge (understanding) by using it in context (applying it). This demonstration of understanding might be for the benefit of others but the major benefit accrues to the learners themselves. It is possible to apply knowledge blindly of course, with little understanding of the concepts and reasons for actions and outcomes. For example, the 'natural' snooker player may never reflect upon and understand the mathematical niceties of spin or cue-to-ball contact that make them champions. However, most people will benefit from training that explains and then practises the skills necessary to optimize these features of play. In many areas of life and work, action informed by understanding is generally more focused, efficient and, hopefully, successful. Taking basic information such as lecture notes or a literature review, and developing understanding through discussion, analysis and synthesis, will generally enable better and more purposeful application of the newly gained knowledge in solving problems or making decisions.

Create and promote

Once they are comfortable with their grasp of a learning context, learners may fashion their new knowledge in transferable forms (creating 'learning objects') to make it available to other learners in a communal learning resource space (promoting the learning objects they have created).

e-Learning offers unique opportunities to create new knowledge and to promote its use by others through the ease of communication and dissemination of the new knowledge, within a community of learners context. Indeed, this process is an explicit difference between the learning made possible with new technologies and the older, traditional models of learning, whether these might be the restrictive didacticism of teacher-led learning or the greater freedom of teacher-facilitated learning.

By knowledge, it must be emphasized, we do not mean merely facts or conceptual understanding. We also mean new ways of looking at existing knowledge, new insights to complex processes and access to the experience and expertise of others in relation to the context of the learning. With the vast amount of knowledge now available on the World Wide Web, it is reasonable to accept that methods of accessing, storing and retrieving information are now much more important aspects of the learning process than perhaps they have been in the past.

As knowledge is more and more easily constructed and disseminated, the learner nowadays is also called upon more often to judge its usefulness and, indeed, whether or not it is trustworthy and factual. Technical advances are making authoring and publishing tools easy to use, enabling learners to engage in sophisticated communication and interaction, between themselves and their various audiences (for example, their assessors or professional, academic and community groupings with an interest in their work). As new ways of looking at knowledge emerge, the ease and freedom of publishing on the Internet has resulted in an excellent environment for teachers to guide students in creating their own online classes for other learners – a true community of learners in which the learners provide resources and learning opportunities for their peer learners.

BLOOM'S TAXONOMY

Readers versed in education theory will no doubt recognize a resonance between the framework of e-Learning practices above (Analyse, Synthesize, and so on) and Bloom's Taxonomy (Bloom et al., 1956) of increasingly sophisticated intellectual skills, namely: Knowledge, Comprehension, Application, Analysis, Synthesis and Evaluation. The taxonomy retains considerable

relevance today and, although it is often referred to as a hierarchy of skills, it was never meant to be seen as some form of sequence in which some skills are achieved before others, implying for example that 'apply' cannot come before 'comprehend'. Any notion that such a linear hierarchy could apply to learning situations in the twenty-first century is definitely a non-runner. Since Bloom's committee proposed the taxonomy in the 1950s there have been revolutionary changes in education brought about by a variety of developments. These include the rise of learner-centred education, the onset of mass education and, most importantly in more recent times, the phenomenal emergence of information and communications technologies in education.

In the 1950s only the most far-sighted of futurologists could have conjured up the possibility of a learning resource as immense as the Internet, or the power of some of its search engines. Learners today, for example, have almost instant access to a search of over 8,000,000,000 (that is, 8 billion) Web pages courtesy of systems such as Google, with some 11.5 billion pages overall. On first encounter, most learners might see this solely as what we would call 'information noise'. In relation to this vast amount of available Knowledge, a *linear* trek through any hierarchy of skills, such as Bloom's taxonomy might suggest, will likely be disrupted by the need for Analysis before Application, for example, or the need for judgement (Evaluation – the highest skill in Bloom's taxonomy) from the initial search. Only through a *combination* of Knowledge, Analysis, Synthesis, Application, Evaluation and Comprehension, therefore, is it likely that learners will truly assimilate what they need as new knowledge. By the same token, only by an appropriate combination of any two or more of the practices in Figure 1.1, will learning progress today.

It is not surprising that in the context of the very formal and didactic approaches to education in the 1950s, Bloom's committee did not explicitly identify collaboration as another powerful facilitator of individual learning. No criticism of them is intended, of course; their contribution to educational theory is immense. The connectivity of information and communication technologies today, however, is such that collaboration is not simply a casual social activity on the margins of learning; it is becoming more important in supporting thinking and assimilating new knowledge and understandings.

e-LEARNING

If learning and learners have experienced major changes since Bloom's day, it is inevitable that schoolteachers, university lecturers and private sector trainers have been facing equally major changes in the way they approach their work. Tutors today are required to go beyond selecting a textbook for their students. Now they must regularly evaluate new resources; searching, selecting, evaluating, planning for, implementing and managing them in order to promote best practice in learning. e-Learning for many is the 'mission critical' and must be explored, first and foremost, from a learning perspective. An exploration of the state of the art of e-Learning is essentially, therefore, an examination of the most advanced features of information and communications technology that can support, create and deliver an educational experience. At its best, e-Learning offers new opportunities for both the educator and the learner to enrich their teaching and learning experiences through virtual environments that support not just the delivery, but also the exploration and application of information. Debate about the pros and cons of e-Learning is typically focused on a perceived lack of face-to-face contact. This has resulted in a mix of e-Learning and more conventional learning – a process entitled blended learning. Rather than having one type of learning experience mandated for them, learners should be able to have as much choice and selection as possible. There is a real need for a text on e-Learning that provides a solid foundation to the field but which also models some of the processes involved in the multi-faceted and multi-focus knowledge-building that is at the heart of the successful e-Learning experience. This book therefore seeks to present an overview of what e-Learning currently is and a vision of how it will develop in the future.

THE CHAPTERS

In designing this book's structure, therefore, we felt that readers would want to get straight into finding out what e-Learning is. The next chapter, 'Enter e-Learning', addresses this need by describing what e-Learning currently is, illustrated by a range of examples. Chapter 3, 'A potted history of e-Learning' charts the history of e-Learning for those who wish to know how it all came about while Chapter 4, 'e-Learning – an educational

revolution' is on how e-Learning is set to revolutionize still further our approaches to learning. Who is e-Learning? What are they e-Learning? When and where are they e-Learning? These are questions that this chapter addresses.

Chapter 5, 'e-Learning theory – communal constructivism' then looks at how learning theory is coping with the new modes of learning and the wider concept of the learner that has evolved in recent times. At the heart of this chapter, 'communal constructivism' is presented as the key extension to socio-constructivist theory to underline e-Learning. Communal constructivism is an extension of modern learning theory's most central idea, in which learners construct and assimilate their own knowledge from their own learning opportunities. Within the networked communication world that e-Learning provides, it is a natural step to the formation of communities of individual learners pursuing the same goals. From there the next step is to learn as a community; constructing and sharing knowledge at a community level in a form of social constructivism. Communal constructivism takes this yet another step further by identifying a process in which the learners involved deliberately contribute their own learning to a community resource base for the benefit of their peers and future learners.

Chapter 6, 'e-Learning design – concepts and considerations', examines how e-Learning activities and resources can enrich the learning experience and how they can be used to scaffold students' thinking, to integrate critical thinking skills and to provide 'cognitive apprenticeships' which furnish the learner with opportunities to engage with experts in the subject of their learning. 'Empowered learners – powerful tools for learning' is the subject of Chapter 7 and focuses on how a variety of design features for e-Learning, for example in terms of layout and navigation, have been used to maximize learners' opportunities to manage the growing communal knowledge space. There are problems of course, such as copyright in relation to learning objects created by others, and these too are aired. A number of examples, which will include students' use of wireless networks in lectures to surf for more detailed notes, are used to highlight the potential and the issues involved.

The key themes of Chapter 8, 'e-Learning – learner emancipation', are the accessibility and impact of e-Learning on communities of learners who experience special access difficulties. e-Learning is, of course, a highly

visual learning environment and to make it amenable to those without sight
or with partial sight is one the greatest challenges there is. Chapter 8
addresses this challenge with examples that can be extended to other
groups with special needs.

The final chapter, 'e-Learning – endless development?', concludes the
tour of the concepts and practice in e-Learning by looking to the future to
try to establish where the new developments in e-Learning might be.
Indeed, the question is posed: is there an end in sight to e-Learning devel-
opments? The creation of self-generating and self-sustaining e-communities
can only extend opportunities for their members and, ultimately, global
society as a whole to continue learning and to build the knowledge base for
new learners as they continuously come on-stream. The technological and
infrastructural developments of today, such as nano-technologies, the
Semantic Grid and emerging communal learning tools such as wikis and
blogs, underpin the argument that we are looking at a future that will pro-
vide anywhere (mobile and ubiquitous) and anytime online access for every
citizen to an almost inconceivably huge knowledge and learning space. In
Chapter 9 we give this phenomenon a name: the 'Communal Yottaspace' of
knowledge (where 'yotta' is the largest defined number in the Systeme
Internationale of measurement, 10^{24}).

So where to first? We have named Chapter 2. 'Enter e-Learning' as a
means of establishing the backdrop for the rest of the text. The initial focus
is the perhaps obvious question: why do we have e-Learning? A definition
is offered and developed on the basis of an exploration of the key aspects
of learning and e-Learning, and how the convergence between them is pro-
gressing. The benefits of e-Learning are argued and the challenges and
opportunities surrounding its use are explored.