INTERNATIONAL JOURNAL OF INSTRUCTIONAL TECHNOLOGY AND DISTANCE LEARNING

March 2009
Volume 6 Number 3

ISSN 1550-6908

PUBLISHER'S DECLARATION

Research and innovation in teaching and learning are prime topics for the *Journal of Instructional Technology and Distance Learning* (ISSN 1550-6908). The Journal was initiated in January 2004 to facilitate communication and collaboration among researchers, innovators, practitioners, and administrators of education and training involving innovative technologies and/or distance learning.

The Journal is monthly, refereed, and global. Intellectual property rights are retained by the author(s) and a Creative Commons Copyright permits replication of articles and eBooks for education related purposes. Publication is managed by DonEl Learning Inc. supported by a host of volunteer editors, referees and production staff that cross national boundaries.

IJITDL is committed to publish significant writings of high academic stature for worldwide distribution to stakeholders in distance learning and technology.

In its first five years, the Journal logged over five million page views and almost one million downloads of Acrobat files of monthly journals and eBooks.

International Journal of
Instructional Technology & Distance Learning

Vol. 6. No. 3.

ISSN 1550-6908

Table of Contents – March 2009

Editorial

Time for Transformation

Donald G. Perrin

Our world is transformed by *Decision Sciences*, tools that optimize management of operations, networks, and systems in our daily activities. *Decision Sciences* solve complex problems with large numbers of variables; *decision* variables (ones we control), and *environmental* variables (factors that influence outcomes that we cannot control). Decision science is based on operations research, system design, and a mathematical tool called Linear Programming (not to be confused with computer programming). It is the basis of powerful search and selection tools such as Google and the American Airlines booking system. It is used to optimize regional and global transportation networks and supply chains (road, rail, sea and air), inventories (food, raw materials, and consumer goods), and electronic networks (telephone systems, power grids). *Decision sciences* optimize routing (USPS, UPS, FedEx) and travel (Google Maps, Sigalert.com and Geographic Positioning Systems (GPS)). *Decision sciences* support business and financial operations (investing, market research, new product development, optimizing planning and management to maximize profit and minimize risk.)

Surely these powerful management tools have a role to play in transforming education! Where do we start? Begin by defining relevant goals and objectives to prepare students for their role in advancing social, political, and economic needs of their world, both present and future. Follow up by optimizing our learning systems to ensure high motivation, relevant learning experiences, and effective implementation.

Knowing that every learner is unique, we need the power of decision sciences to dynamically optimize learning at every step. That requires a database base of knowledge and skills already acquired (like R2D2 in Star Wars), diagnostic-prescriptive tools to optimize learning, and a road map to guide the learning process toward established and dynamically changing goals (Individualized Education Program - IEP). The process must be sensitive to the personality, awareness, learning preferences, priorities and passions of the learner.

In an era where funds are diminished, class size is growing, and even the youngest students are competent in Information and Communication Technologies (ICT), it is time for a paradigm shift to optimize technologies for learning management and delivery, and optimize human qualities (teachers) for counseling, guidance and tutoring and using the diagnostic-prescriptive tools to meet individual learner needs. The solution begins in teacher training institutions, magnet schools, and successful research that points us toward interactive multimedia, learning objects and learning management systems.

Are we ready to transform education, or will those who use decision sciences and state-of-the-art technologies make the transformation for us?

This issue of the Journal features current research from many countries – Canada, India, Iran, Finland, Russia, Sri Lanka, Sweden, and the USA. It ranges in scope from the latest mobile interactive technologies and social networking to language learning, curriculum development, and instructional design. The editors are grateful for the large number of authors submitting papers, and the reviewers are working very hard to keep up. We expect to greatly expand the number of reviewers in the near future.

Editor's Note: Social networking and related Web 2.0 technologies create new opportunities for learning from computers and a wide range of mobile communication devices. This article extends our concept of flexible and open learning in the anywhere-anytime environment.

Learning Agents Framework Utilizing Ambient Awareness and Enterprise Mashup

Jinan Fiaidhi and Sabah Mohammed

Canada

Abstract

For a learning agent to support a human in learning it is important to be aware of the progress made in a given enterprise and build on it. This article introduces a framework to obtain such an awareness of the human's learning progress for an enterprise by using ambient awareness and ambient intelligence models along with mashup services.

Keywords: ambient learning, social networks, web 2.0, ami, ambient awareness, enterprise mashup, collaborative learning.

Introduction

The common understanding of e-learning shifted over the last decades from the traditional learning objects portals to learning paradigms that enforces constructivism, discovery learning and social collaboration. Today most educational institutions are equipped with at least some kind of tools (mostly web-based) that bring together people and content artifacts in learning activities to support their learning activities in constructing and processing information and knowledge. Moreover, web-based learning is becoming common learning ground as the Web is representing a delivery medium, as well as a provider of content and subject matters. With the advent of the Web 2.0 technologies, web-based learning is shifting more to a new learning community driven environment. While the success of web-based learning (still) requires a careful selection of appropriate communication/collaboration tools, the underlying software methodology is shifting from (passive) content consumption towards (active) content creation (Spaniol, Klamma and Cao, 2008).

Web 2.0 technologies are offering very attractive capabilities for learners to collaborate and share learning contents (e.g. learning objects, drawings, animations, pictures, digital videos, texts etc.). Although the advantages of Web 2.0 related to learning are obvious (Ullrich et al. 2008), Web 2.0 technologies keep advancing with new challenges that we need to understand and solve. Recently Web 2.0 technologies are embracing Enterprise Mashup as a mean for collaboratively creating new contents and some researchers like Eisenstaedt (2007) praises its importance for learning. Indeed, the promise of remixing existing online services and data into entirely new online application and content has captured the software industry's attention. Many notable software vendors produced several environments and frameworks for Enterprise Mashup (e.g. Oracle Fusion Middleware, Mainsoft Microsoft SharePoint Federator and IBM WebShere Portal, Adobe Flex) which have offered the potential to finally make widespread software reuse a reality. However, though anecdotal evidence seem to abound — there are a good number of stories about businesses creating isolated mashups here and there, we're clearly still not yet seeing the flood of mashup-based apps inside of the educational institutions despite their consistent and steadfast growth on the web. Dion Hinchcliffe (2007) described some major challenges facing Enterprise Mashup programming and technology that requires effective remedies. However, this article introduces a new learning perspective and framework for adopting Enterprise Mashup for Enterprise Learning based ambient awareness and learning agent's technologies.

Enterprise Mashup for Ambient Learning

Ambient Learning and Ambient Intelligence are promising concepts for new methods of learning and in particular for adapted, comprehensive and personalized learning environments. These concepts help learners and institutions to keep up with the rapidly changing knowledge-based economy. Ambient learning is designed to facilitate access to high quality e-learning material tailored to the needs of an individual learner. These needs are determined by the time, place, pace and context that best suits the individual learner. Ambient learning through the provision of content integration and composition allows access to, new e-learning material as well as existing catalogues/e-learning resources (Paraskakis 2006). Although ambient learning is based on Ambient Intelligence Technologies (AmI) its use is not only limited to rooms and buildings. Ambient learning is taking new dimensions as it can be realized by technologies that combines both Ambient Intelligence and Web 2.0 AmI involves the convergence of several computing areas. The first is ubiquitous or pervasive computing where its major contribution is on the development of various ad hoc networking capabilities that exploit highly portable and very-low cost computing devices. The second key area is intelligent systems research, which provides learning algorithms and pattern matchers as well as other classification, interpretation and situation assessment capabilities. A third element is on context awareness (e.g. track and position objects).

The basic advantage of using AmI in any application is to enhance interactions between objects. However, the social focus/perspective of the AmI research is largely neglected (Bohn et al 2005). Instead of enhancing interactions with technological objects, there is a need for possible AmI applications that can enhance interactions with other people (Cassens 2008). Enhancing the interactions among people contributes to what is currently termed as the *Social Ambient Intelligence* or Ambient Awareness (Rizopoulous 2007). Central to the social ambient intelligence research is the use of Web 2.0 techniques within AmI applications. In fact, the Web 2.0 approach has revolutionized the way we use the web and certainly, it can have major positive impact on the AmI research. On one hand, Web 2.0 enables the active participation of users with new contents such as wiki pages, blogs or online multimedia tagged. On the other hand, Web 2.0 transforms the Web into an application-enabling platform. ***Enterprise Mashups,*** one of the hottest ***Web 2.0*** technologies today, could affect your ambient learning in a very positive way. Before the enterprise mashup, that same business user had to sign in to several applications and go to different Web sites to manually collect the information and then try to make sense of it. The enterprise mashup web application overcomes this hassle in an elegant way and allows the user to harness more of the collective intelligence in the enterprise to make better decisions. Mashups have the opportunity to increases the strategic value of learning—by delivering enriched information to users—and reduce time cycles spent on custom development. However, mashups have been around for years and the concept of the end-user being able to easily 'drag-drop' and put together a hacked up application within minutes hasn't - and this is what is causing a major obstacle. For mashups to really take off, we need to be able to capture the context of information. Information becomes relevant, and more useful when it is placed in the right context. If a Mashup can leverage of some form of social context, it would then be able to provide the relevant information to the user. In this direction, social mashups are a new trend that takes the traditional mashup one-step further. Ultimately, in an enterprise, social interaction is a key part of how information is tied together and increasingly more relevant to how individuals want to visualize information. Hence, linking people, processes and information through mashing can creates a real social enterprise mashup.

The Learning Agents Framework

There are many historical attempts to develop a framework for e-learning including Learning Objects, Learning portals, Web-Based Learning (WBL), Web-Based Instruction (WBI), Web-

Based Training (WBT), Internet-Based Training (IBT), Distributed Learning (DL), Advanced Distributed Learning (ADL), Distance Learning, Online Learning (OL), m-Learning, Remote Learning, Off-site Learning, a-Learning (anytime, anyplace, anywhere learning). However, a learning environment consists of a dynamic mix of many different types of resources and facilities, which should be aware of, and adapt to, the learner in his/her current context. This multiplicity of technologies including the recent waves of Web 2.0 and Web 3.0 demands sort of service-oriented approach, and this in turn leads us to ambient learning when learning goals are focused on collaboration, contextualization, ubiquity and accessibility (See Figure1).

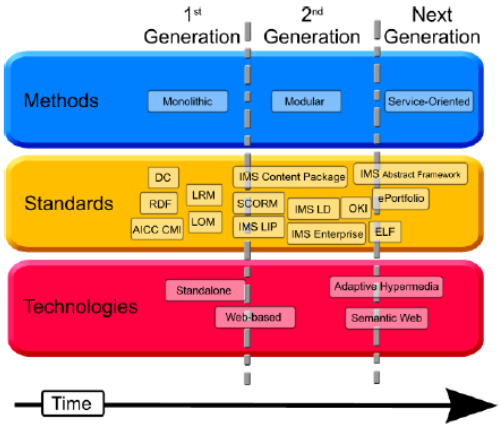


Figure 1: Towards Service Oriented Learning (L Declan Dagger et al (2007)).

Collaboration and contextualization can only be supported through services, which can be created and modified dynamically to suit the current needs and situations of learners. Ubiquity and accessibility, however, requires services which can adapt to the capabilities of the infrastructure (Allison et al 2004**;** Dagger et al 2007**).** Therefore, Service Oriented Architecture (SOA) and in particular those that are based on lightweight RESFul Web Services have become active areas of research and development in learning. Enterprise Mashup and ambient learning represent excellent examples of applications that utilizes such the RESTful web services technologies (Kölmel and Kicin 2005). Based on Ambient learning and the Enterprise mashup, the learners participate and co-operate in, for example, syndicating, re-mixing, or creating learning materials and environments. On one hand, mashups, by their very definition, involve a man-in-the-middle and rely on RESTful communication protocols (e.g. RSS, ATOM). While Web Services based on SOAP as a transport can provide only end-to-end services. As a result, the practice of mashup services has become increasingly popular in the Web development community compared to the traditional Web Services composition and integration. In fact, mashup services bring flexibility and speed in delivering new valuable easy-to-use eLearning service, which allows any time, any where and any how access to personalized, high quality learning content. With the rediscovery of AJAX (Asynchronous JavaScript and XML) technology, we now have the ability to create RESTful mashups that quickly solve learning problems. On the other hand, ambient learning aims at seamless delivery of ubiquitous services, continuous communications and intelligent user interfaces and context-awareness. In this sense, ambient learning systems needs to provide autonomy, distribution, adaptation, pro-activeness and responsiveness as the key characteristics, which are similar to the characteristics learning agents (Hagras et al 2004). Learning Agents are computer programs capable of flexible autonomous actions in a dynamic environment and are apparently a suitable choice for implementing ambient intelligence systems (Tapia et al 2008). In fact, learning agents inside the Enterprise provide an ecosystem for creating and sharing learning knowledge (Vuor 2005). Based on learning agent's solutions, learners are empowered with

personalized software assistants or learning agents to uncover high-value data, resulting in cost reduction and higher productivity. Using Learning Agents "trained" to do anything a human can to monitor, harvest, extract, process, deliver and integrate dynamic content from the internet, intranets, extranets and Enterprise applications – Learners can access the data that are normally inaccessible. Not only can information be accessed, it can be shared and mashups can be created and made available to key learners. Empowering learners in this way can produce enormous educational returns.

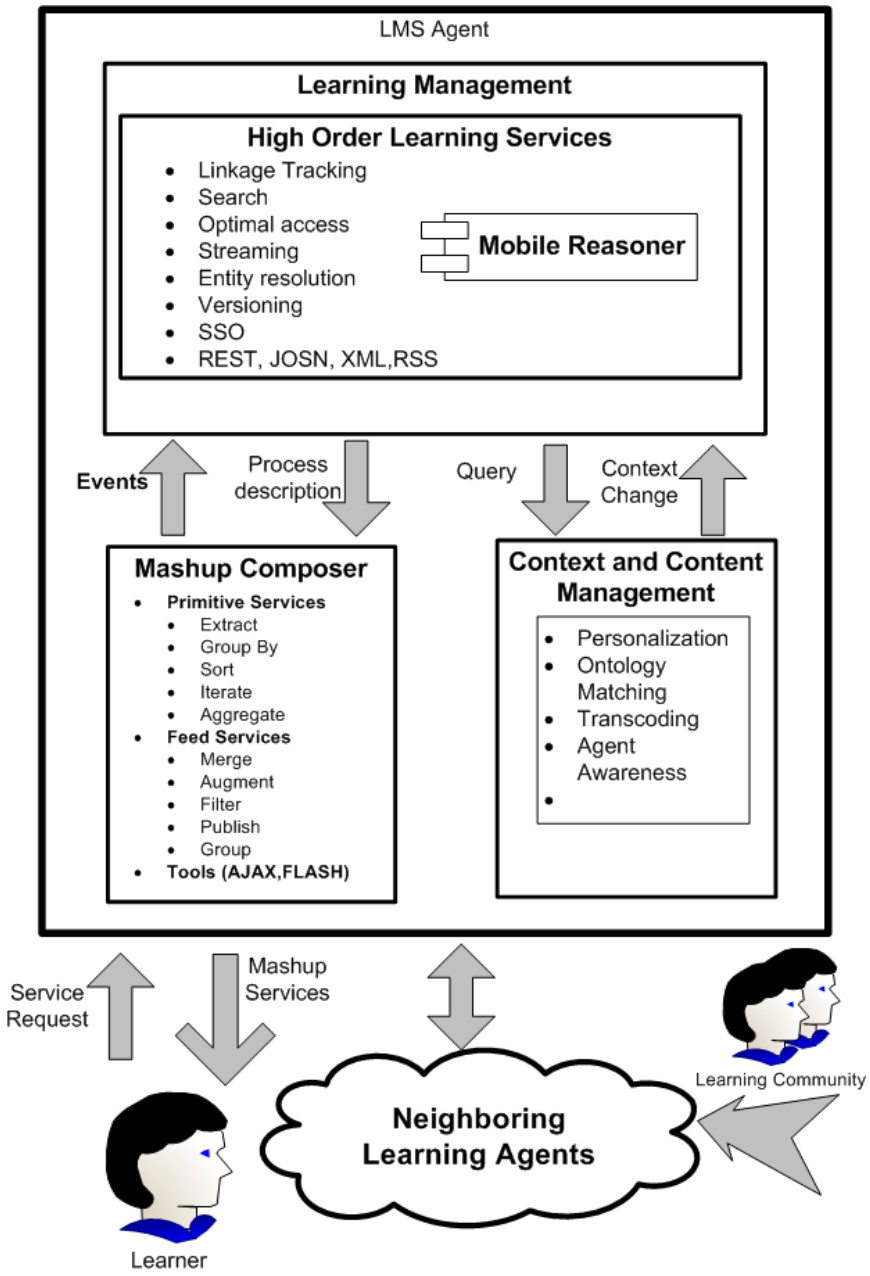


Figure 2: The Learning Framework based on AmI and Enterprise Mashup.

Figure 2 illustrates our vision to the new learning agents framework that employs both Ambient Intelligence and Enterprise Mashup. The learning agents have the ability to obtain automatic and real-time information about the learner's context using a set of technologies. The framework utilizes learning agents where users can interact on a level that best suits their needs and capabilities, leaving tedious chores to the learning agents. Intelligence and ambient awareness enables the learning agents to learn about their user and adept the environment.

The framework provides tools to quickly capture and share knowledge among users in an enterprise. Hence, search engines are part of both the creation and deployment of knowledge content and knowledge integration can be achieved through mashups. These technologies allow the information to be linked with the other learning processes more easily where it allows more rapid content creation, dissemination, and more importantly, contextualization.

Conclusion

This article provides a framework for the migration of legacy web learning to a service-oriented learning paradigm by means of ambient awareness and mashup services. The authors are engaged currently in developing a prototype for implementing the proposed framework. Some early references to the progress in implementing various aspects of this framework for a biomedical learning enterprise can be found in (Mohammed, Fiaidhi and Mohammed, 2008, 2008a).

ACKNOWLEDGMENT

The first author NSERC Discovery Grant supports this research.

References

Allison, C. Bateman, M. Nicoll, R. Ruddle, A. (2004), Adaptive QoS for collaborative service-oriented learning environments, In CCGrid 2004 Proceedings. IEEE International Symposium on Cluster Computing and the Grid, 2004, 19-22 April 2004

Bohn, J, et al. (2005) , Social, Economic, and Ethical Implications of Ambient Intelligence and Ubiquitous Computing, In Ambient Intelligence, Editors Werner Weber, Jan M. Rabaey and Emile Aarts,Springer Berlin Heidelberg, 2005

Cassens, Jörg (2008), Explanation Awareness and Ambient Intelligence as Social Technologies, PhD Thesis, 2008, Norwegian University of Science and Technology, Faculty of Information Technology, Mathematics and Electrical Engineering, Department of Computer and Information Science.

Dagger, D. et al. (2007), "Service-Oriented E-Learning Platforms: From Monolithic Systems to Flexible Services," IEEE Internet Computing, vol. 11, no. 3, pp. 28-35, May/June 2007,

Dante I. Tapia, D. et al. (2008), An Ambient Intelligence Based Multi-Agent Architecture, Springer Paris, 2008

Dion Hinchcliffe (2007) The 10 top challenges facing enterprise mashups, ZDNet Online Journal, October 16th, 2007 http://blogs.zdnet.com/Hinchcliffe/?p=141

Eisenstadt, M. (2007), Does Elearning Have To Be So Awful? (Time to Mashup or Shutup), ICALT 2007. Seventh IEEE International Conference on Advanced Learning Technologies, 18-20 July 2007 Page(s):6 – 10

Hagras, H. et. al. (2004), Creating an Ambient-Intelligence Environment Using Embedded Agents, IEEE Intelligent Systems, Volume 19 , Issue 6 (November 2004), Pages: 12 - 20

Kölmel, B. and Kicin, S. (2005), Ambient Learning: The experience of ambient technologies in eLearning, IFIP International Federation for Information Processing, Springer, Volume 171/2005

Mohammed, S. Fiaidhi, J. and Mohammed, O (2008)Sharing Biomedical Learning Knowledge for Social Ambient Intelligence, Presented for Publication, Journal of Computers, Academy Publisher-Finland, December 2008.

Mohammed, S. Fiaidhi, J. and Mohammed, O. (2008 a), Developing an Ontology Extraction Agent for a Biomedical Learning Social Network, NASTEC 2008 Int. Conference, August 13-15, 2008, McGill University, Montreal, Canada.

Paraskakis, I. (2006), Ambient Learning: Rationale and its use in Supporting Blend Learning for Executive Education, 2006. Sixth International Conference on Advanced Learning Technologies, 5-7 July 2006 Page(s):144 – 146

Spaniol, M, Klamma, R. and Cao, Y. (2008), Learning as a Service: A Web-Based Learning Framework for Communities of Professionals on the Web 2.0Advances in Web Based Learning – ICWL 2007 (2008), pp. 160-173.

Rizopoulos, C (2007), An activity-based perspective of interacting with ambient intelligence systems, 2007. IE 07. 3rd IET International Conference on Intelligent Environments, 24-25 Sept. 2007 Page(s):81 – 88

Ullrich, C. el. Al (2008), Why web 2.0 is good for learning and for research: principles and prototypes. WWW 2008: 705-714

Vuori, E.K. (2005), Knowledge-intensive service organizations as agents in a business ecosystem 2005. Proceedings of ICSSSM apos;05. 2005 International Conference on Services Systems and Services Management, Volume 2, Issue , 13-15 June 2005 Page(s): 908 - 912 Vol. 2.

About the Authors

Jinan Fiaidhi is a Professor of Computer Science at Lakehead, University, Ontario, Canada. Her current research focuses on ubiquitous learning.

jfiaidhi@lakeheadu.ca

Sabah Mohammed is Professor of Computer Science at Lakehead, University, Ontario, Canada. His current research is in Web Intelligence.

Sabah.mohammed@lakeheadu.ca

Editor's Note: This article is well supported by research. It meets a recognized need for integration of language with academic content for a more extensive and productive learning experience.

Widening Access to Education: A Case for Bilingual Distance Curriculum

Irshat Madyarov

Russia/Iran/USA

Abstract

The article discusses recent curricular developments at the Baha'i Institute for Higher Education in a Middle Eastern country. The Institute is striving to provide access to quality education by outreaching to international English-speaking faculty resources, while still relying on the local Farsi-speaking professors. This emerging bilingual distance curriculum faces two challenges: how to seamlessly integrate English-medium instruction in a non-English speaking environment, and how to do it via distance learning. Due to its interdisciplinary nature, much of the paper contextualizes its discussion through current literature in foreign language instruction. It highlights pitfalls of some academic English programs and suggests how they can be overcome by the introduction of English content-based instruction, an approach that fosters English through a college-level subject matter. The paper also outlines the most current developments in this bilingual distance curriculum drawing upon some findings of recent studies conducted at the Institute. Finally, it offers several projected curricular adjustments in view of the given context and current literature.

Keywords: Middle East, higher education, English for academic purposes, English as a foreign language, human rights

Introduction

Open and distance learning (ODL) is making education more accessible to marginalized populations across the world. However, this unique capacity of ODL to cross geographical borders creates linguistic and cultural barriers (Jegede, 2000). One challenge is how to make such education accessible to the world-wide population of learners who speak languages other than the medium of instruction.

This paper makes a case for the integration of English-medium instruction in a distance environment through an example of a Farsi-speaking university in a Middle Eastern country - Baha'i Institute for Higher Education (BIHE). The university is striving to meet the needs of a large population of young people who are denied access to higher education on the grounds of religious beliefs in their home country. To overcome these local challenges, BIHE is adjusting its curriculum to include distance courses, which open up doors for international collaboration. Some distance courses are now taught by English-speaking professors from abroad, and this creates an inevitable linguistic barrier.

Context and Historical Overview

Baha'i Institute for Higher Education (BIHE) has unique circumstances. Located in a Middle Eastern country, this university until recently used Farsi exclusively as the medium of instruction, except for the English linguistics major students whose courses have always been delivered primarily in English. Recent developments have been changing the shape of the curriculum dramatically by reducing face-to-face contact between students and instructors and by adding English as an additional medium of instruction.

BIHE was established in 1987 as a community response to violations of human rights that left thousands of Baha'i youth without access to higher education. Since its inception, BIHE has grown to offer 14 undergraduate and 3 graduate degrees totaling in over 700 courses (Baha'i Institute for Higher Education, 2008). With the emergence of distance education, BIHE started employing international faculty who use English as a medium of instruction. Presently, some courses are taught in Farsi, others in both English and Farsi, and a few completely in English. While this change provides more access to most current education, it also places high English proficiency demands on students. Successful integration of English as an additional medium of instruction in this online environment has become part of the commitment to quality education in BIHE.

The current BIHE semester lasts 20 weeks, of which four weeks are reserved for the preparation and administration of the proctored midterm and final examinations. An academic year at the university includes two semesters, with the fall semester starting in September and ending in February. The spring semester runs from April until August.

Given the new directions with Internet-based distance education and plans for the integration of English as a medium of instruction, BIHE commissioned a preliminary assessment of English proficiency of a small sample of freshmen students in Fall 2005. Forty-three students took the Test of English as a Foreign Language (TOEFL), a measure of academic English readiness widely used in US universities. Figure 1 shows that only 21 % of these students were ready for English-medium instruction at an undergraduate level by US standards (TOEFL score of 500-550). Twenty-six percent of them knew hardly any English if at all (TOEFL score of 310-330). The bulk of the students fell in the category of intermediate level proficiency (this pattern remained more or less consistent in Fall 2008). This level of English proficiency of BIHE freshmen called for a rigorous long-term English program in the BIHE curriculum.

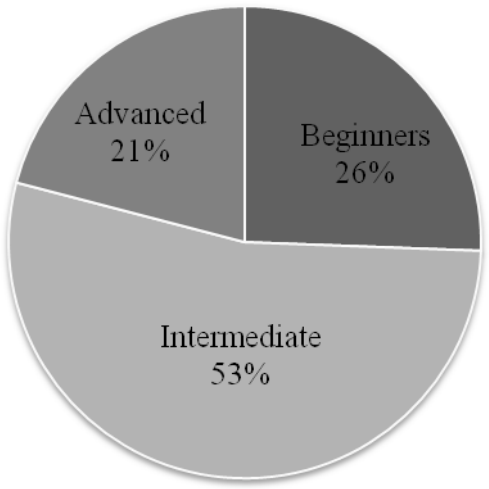


Figure 1. TOEFL scores of 43 freshmen students divided into three levels of English proficiency: beginners, intermediate, and advanced.

Prior to 2005, BIHE provided English instruction through individual departments. Each department would develop and offer a combination of face-to-face and correspondence English courses at different levels of proficiency with more focus on English for specific purposes at higher levels (e.g., English for chemistry, engineering, sociology majors, etc.). The amount of exposure to English throughout the academic career at BIHE varied from 40 to 420 contact hours within the period of 2 to 6 semesters, depending on the department and the major. This amount of exposure was largely insufficient compared to a typical academic English program in the U.S.,

where students may receive up to 400 contact hours of English instruction within a single semester. In addition, these efforts of individual departments were isolated and hence lacked a unifying framework and understanding. With the current vision of a bilingual online university, this situation is changing.

In 2005, BIHE launched the first online English course - EFL 101 course (a lower intermediate course) designed to be a core curriculum course across all majors. An evaluative study of this course showed some promising gains in English within a 20-week semester of instruction, as measured by TOEFL pre- and post-tests (Madyarov, 2009). These gains are more obvious among students at the beginning English level proficiency, which is not surprising given that the course was designed for this level in the first place (see Table 1). Even though these findings cannot be conclusive due to a small sample size, tendencies are obvious.

Table 1

t-test of TOEFL pre- and post-tests (N=27)

Proficiency level	t-test				
	Listening	Structure[1]	Reading	TWE[2]	Total
Beginners (n=8)	5.13**	2.30*	3.91**	1.83	3.71**
Intermediate (n=10)	1.72	0.15	0.74	0.71	0.92
Advanced (n=9)	1.66	0.86	2.16	1.00	0.53

Note. *p<.05. **p<.01.

1. Structure – primarily measures knowledge of English grammar
2. TWE – Test of Written English.

In 2007, almost 1,000 students from different departments were taking four online EFL courses at a time: EFL 100 (beginning level), EFL 101 (low intermediate level), EFL 102 (intermediate level), and EFL 103 (high-intermediate level). These courses reflect the most recent developments in the BIHE curriculum. All EFL courses are Flash-based CD packages with integrated lessons on vocabulary, grammar, reading, writing, and listening. EFL 100 is the only self-study course where students do not work with a live instructor due to the lack of faculty resources. Courses EFL 101 through 103 provide interaction among the students and with English-speaking tutors from abroad in the open source Moodle environment and via phone, Skype, and Yahoo Messenger.

Streamlining English for Academic Purposes

How does this typical English for academic purposes (EAP) curriculum fit with the needs of English-medium instruction, particularly, in the distance education environment? Literature abounds with discussion of non-native English speaking students who transition from EAP programs to mainstream university courses in English-speaking countries. In their seminal work, Leki and Carson (1997) offer a break-down of five types of writing assignments identified in EAP programs and mainstream US universities (see Fig. 2). Ironically, content-responsible writing assignments, which are based on course-related content (readings, lectures, experiments, etc.) and are the most common assignments in mainstream university courses, tend to be least represented in EAP programs. Conversely, personal writing, such as essays without reference to course-related content, which are least common in mainstream university courses, tend to be most represented in EAP programs. Indeed, such is the reality of most EAP programs, whose faculty are English teachers and not instructors of typical college courses who expect a firm understanding of course content and its application to practice.

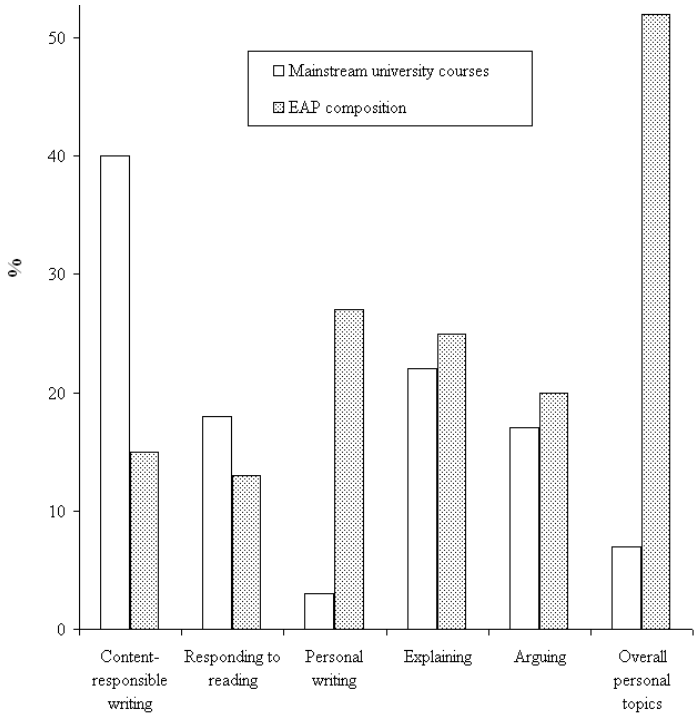


Figure 2. Comparison of writing assignments in EAP composition and mainstream university courses (Leki & Carson, 1997).

Content-based instruction (CBI) within the domain of foreign language teaching provides a pedagogical solution for this gap. CBI refers to teaching foreign languages by focusing on a particular subject-matter, which normally is not the language itself. A classic and simplified typology of CBI consists of three models: theme-based, sheltered, and adjunct models (Brinton, Snow, Wesche, 2003). All models integrate multiple language skills: reading, writing, listening, and speaking, as well as pronunciation, grammar, vocabulary components. The difference between the three models lies in the focus on these two key components: language and content. Theme-based instruction focuses most on language and least on content. Adjunct courses focus most on content and least on language, precisely the opposite, and sheltered courses fall in between the two. In this sense, the three models can be viewed on a continuum (see Fig. 3).

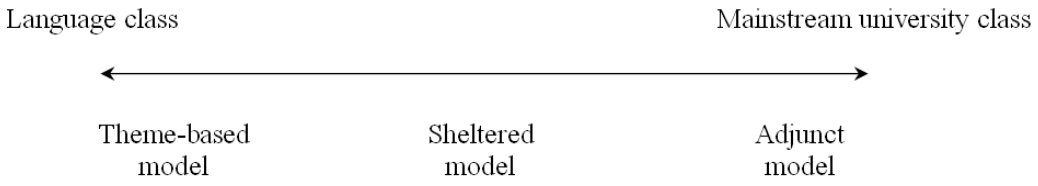


Figure 3. Continuum of content-based instruction.
Adapted from Brinton, Snow, Wesche (2003, p. 23).

Theme-based courses teach the target foreign language through unifying themes in each course module, such as academic achievement, health, global issues, culture, and so forth. Each module addresses listening, speaking, reading and writing, and integrates pronunciation, grammar and vocabulary. The theme-based model is a good fit for beginning and intermediate levels in that the content is not academically demanding (Brinton, Snow, Wesche, 2003).

Sheltered courses are geared towards non-native speakers of the target language, just like the theme-based model. Unlike the latter, however, it is based on a university level content such as psychology, history, anthropology, and the like. Such a course would incorporate language support by adding the so-called modifications or adjustments to facilitate content learning (e.g., using visual aids, redundancy, repetition, simplification of material, glossed vocabulary, instruction on writing style and grammar for writing papers, etc.). In this context, language issues are addressed to the extent as it is supportive of content learning. This model is fit for students with intermediate to advanced levels of proficiency (Brinton, Snow, Wesche, 2003).

Finally, an adjunct course is a mainstream university level course for native speakers of the target language, and as such it has no language related modifications (Brinton, Snow, Wesche, 2003). In a course like this, non-native speaking students are minority and receive extra help with content and language in an adjunct class. This adjunct class is normally taught by a language teacher who collaborates closely with the professor of the mainstream class. This model is best for students with high-intermediate and advanced levels of proficiency (Brinton, Snow, Wesche, 2003).

When Content Based Instruction (CBI), particularly the sheltered and adjunct models, found its way into higher education, it proved very effective in killing two birds with one stone: 1) college-level subject-matter learning, and 2) further development improving the foreign language medium of instruction. Many studies showed that students who took college-level CBI courses, such as history, psychology, political sciences, social sciences, or education not only gained equal grasp of content compared to peers in the same courses taught in their native language, they often outperformed their peers who took foreign language courses in an intensive language program (Brinton, Snow, & Wesche, 1989; Burger, Wesche, & Migneron, 1997; Chappell & de Courcy, 1993; Edwards, Wesche, Krashen, Clement, & Kruidenier, 1984; Hauptman, Wesche & Ready, 1988).

Within the BIHE context, the online series, EFL 100-103, follows the theme-based model of CBI. EFL 101 and 102 provide ample practice for academic personal writing with some focus on argumentation and explanation. EFL 103 adds some assignments that are more content-responsible, by Leki and Carson's (1997) definition, such as case studies and reports on scientists, which resemble assignments in mainstream university courses. This shift towards content-responsible writing, however, needs to increase. Unless students are made responsible for knowing the content at the level required by university professors, which is typical of sheltered courses, this shift is unlikely to occur.

In Summer 2008, BIHE launched the first online sheltered-based course on critical thinking, referred to as the bridge course. It transitions students from theme-based English instruction to English-medium college instruction with demands on content understanding. Choice of critical thinking subject matter was determined by the BIHE curriculum. It had to be a course that would enrich the academic competence of all BIHE students' regardless of their field of study. This online bridge course is the next stage for academic English development after EFL 103.

The course readings in the critical thinking bridge course are organized around eight modules, each running about ten days:

1. History of Critical Thinking
2. Intellectual Attributes of Critical Thinking
3. Ethical Components of Critical Thinking
4. Faith and Critical Thinking
5. Asking Questions
6. Evaluating Evidence
7. Detecting Fallacies
8. Consensus Building and Critical Thinking

This first bridge course had five sections taught by five instructors who were either college-level professors with solid experience in teaching critical thinking or English instructors with some experience teaching content-based courses in critical thinking. The students were held responsible for understanding the course readings and doing a critical analysis of articles and real-life scenarios. Students' performance and grades depended greatly on the accuracy and depth of their understanding of the course readings and application of this understanding to critical analyses. This differs significantly from the online EFL courses including the most advanced EFL 103, where students' performance is measured by the amount of work done and the accuracy of English produced.

The online component of the course was delivered through Moodle, which provided students with access to course materials, grades, synchronous and asynchronous discussion tools, electronic drop-boxes and other online tools typical of most content-management systems. Due to poor Internet connection and sometimes absence thereof, the reading materials were also available on CDs. In addition to the printout versions of the course readings with enclosed glossaries, the CD includes a web version of the readings. This format provided interactivity of Internet pages without having to go online. The glossaries in this format are embedded as roll-over boxes that appear when a student rolls over hyperlinked words (Fig. 4).

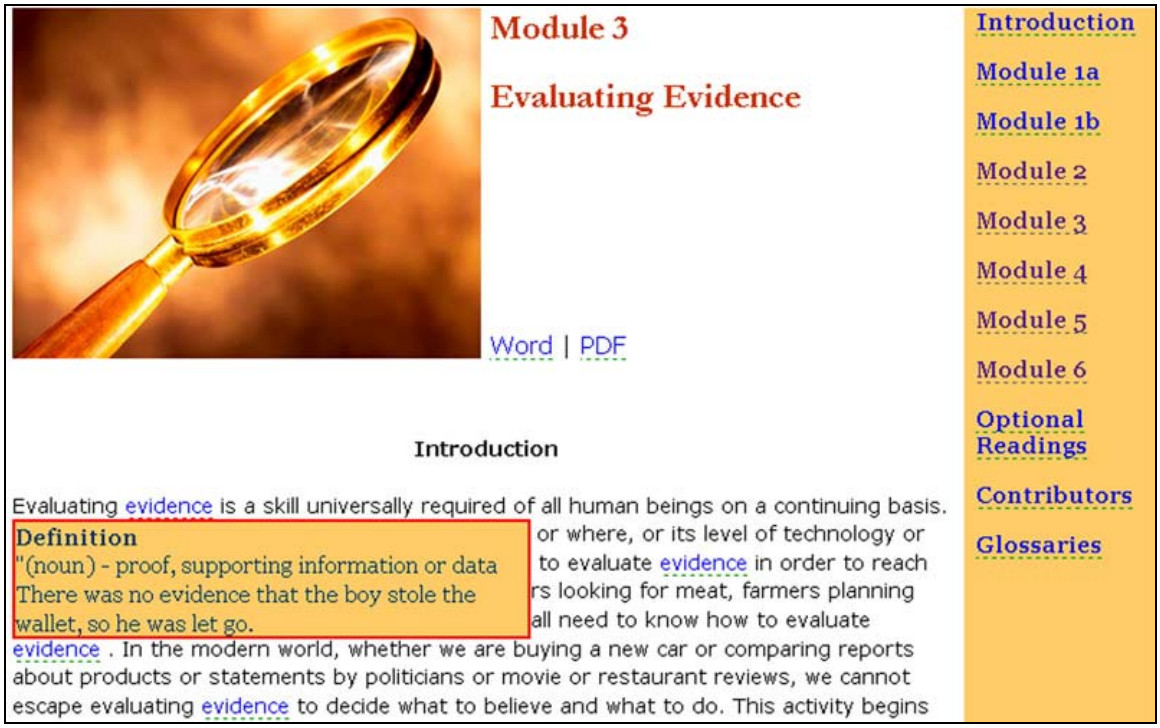


Figure 4. A print screen of the web browser version of an article that shows a roll-over box for a glossed word.

Besides glossaries, the bridge course included other adjustments to facilitate content learning by non-native English-speaking students. Students had a chance to discuss course readings in an asynchronous discussion forum. Before submitting their papers for grading, students received feedback from their instructors on their draft papers that facilitated students' understanding of the content and provided some guidance on language problems. Finally, students had a chance to talk to their instructors during weekly conference calls to clarify their understanding of the content and requirements of the assignments. In addition to these graded assignments, the course had an open forum discussion "Questions and Answers", where students could post any concerns or questions related to the course content or delivery.

An exploratory study took place during this first run of the course. Preliminary findings indicate that students tend to exhibit learning behaviors quite different from those commonly found in the online EFL courses at BIHE. They were forced to re-read course readings many times, refer to dictionaries and encyclopedias for clarifications, seek help from their instructors and other people around them. While these behaviors signal of some level of frustration that could have been addressed more properly, they are also indicative of an immersive nature of content-based courses where students are actively engaged in the use of the target language as they try to meet their content-related demands. At the level of curriculum, such bridge courses promise to create a natural continuity of language instruction in the BIHE curriculum. They enable students to get adjusted to English-medium college-level courses, which come with serious linguistic demands as well as certain social discourse aspects, such as the roles of professor and students, expectations on certain assignments, and the like. (Casanave, 1995; Starfield, 2001).

Future Prospects

When it comes to creating an English-medium curriculum in a non-English speaking environment, a long-term plan is key. It takes years to acquire a foreign language, let alone a foreign language used for academic purposes. Cummins (1981a, 1981b), a recognized expert in bilingual education, proposed a theory of foreign language acquisition, where he divides foreign language proficiency into two broad categories: basic interpersonal communicative skills (BICS) and cognitive academic language proficiency (CALP). BICS is characterized by context-embedded and cognitively undemanding language, typical of daily use of language in informal situations, whereas CALP is context-reduced and cognitively demanding common in schooling settings (see Fig. 5).

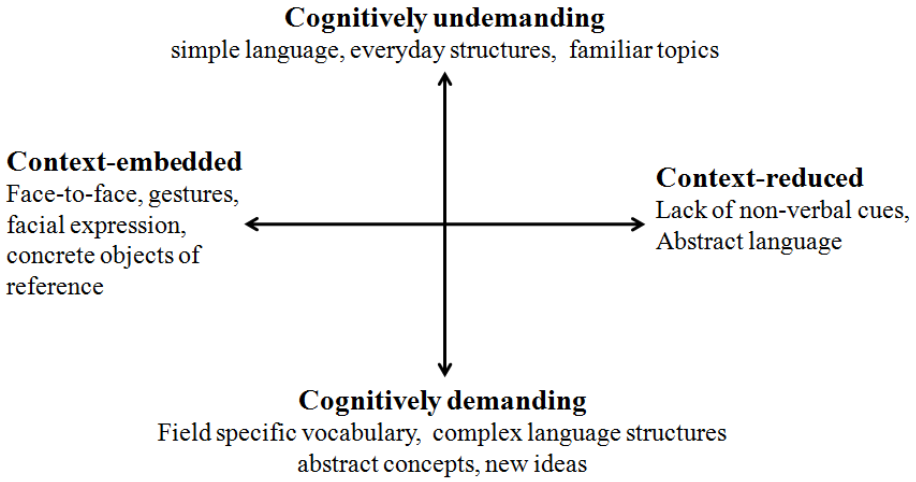


Figure 5. Cummins's (1981b) model of language acquisition with four quadrants.

According to this strand of research, it takes children up to two years to acquire BICS in their non-native language if they live in the target language country. It may take them up to seven years to acquire CALP (Cummins, 1981a).

For adults, CALP acquisition tends to go faster due to more advanced cognitive development and possible prior experience in academia in their native language. However, the implication for the rate of academic language learning is clear. Intensive English programs in the US have at least five proficiency levels, each lasting one semester of intensive 20-25 contact hours of instruction. In this immersion academic environment coupled with the exposure to English outside of school, only highly motivated and capable students are able to transition to mainstream college courses

after two years of instruction. This luxury is not available in a non-English speaking environment, such as Middle East, where students above all are busy taking many other non-English related courses.

BIHE continues to develop its curriculum in view of these challenges. Presently, freshmen entering BIHE take an English placement test that puts them in one of the EFL courses that matches their proficiency level: EFL 100 through EFL 103. Students with the highest level of proficiency skip the EFL courses and go directly to the critical thinking bridge course. Those who start learning English at the beginning level of proficiency (EFL 100) will reach the bridge course by semester five. This much exposure through only one English course per semester, albeit rather intensive – expected 15 hours of workload per week, is still not sufficient to start taking mainstream English-medium courses independently. Figure 6 highlights some current and projected developments for BIHE curriculum.

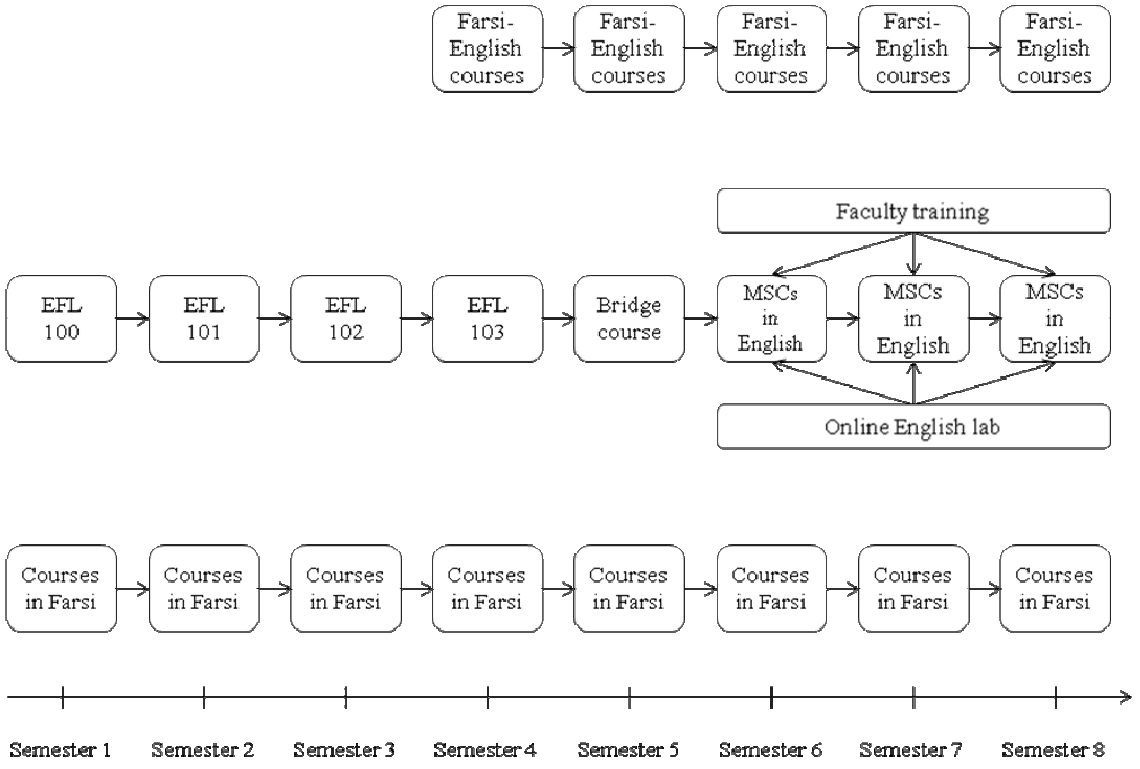


Figure 6. Current and projected adjustments to BIHE curriculum.

Currently, BIHE has three strands of courses: 1) Farsi-medium courses, 2) English-medium courses, and 3) Farsi-English courses. Farsi-medium courses have been traditional at BIHE and still occupy a major role in the curriculum.

The English-medium strand started in 2005 with a series of EFL courses discussed above with the end-goal to prepare students for English-medium mainstream college-level courses taught by international faculty from abroad. However, mainstream college courses at BIHE are different from those in English-speaking countries in that all BIHE students are non-native speakers of English who may still be linguistically challenged due to lack of exposure to English. Therefore, some supporting resources should be available to such students.

One of the proposed adjustments is the training of international English-speaking faculty. Training faculty to adapt their mainstream courses in English to non-native English speaking students is something that is done routinely in some English-speaking countries. In the United States, for example, most states require elementary and secondary school teachers to have the so-called ESOL certification or endorsement. This training ensures that all school teachers are sensitive to the needs of their non-native English-speaking children in class and are accordingly able to adjust their pace, language, and materials. Such a training would raise the awareness of the BIHE international faculty about the challenges their students go through and this faculty would learn how to adapt their courses by adding language-supporting materials: glossaries of key words and concepts, summaries or Power-Point slides of readings presented in a more simplified language, use of visuals and/or animations to demonstrate complex concepts, and the like. In fact, many of these adjustments are similar to the recommendations for distance courses: student support, interaction and feedback, and multiple sources of learning (American Distance Education Consortium, 2003; Indiana Higher Education Telecommunication System, 1999; Phipps & Merisotis, 2000; Western Cooperative for Educational Telecommunications, 1995; White, 2003).

Another proposed supporting resource for mainstream courses is the online English lab. The lab would consist of academic English tutors helping students with their mainstream course-related needs. This solution may be efficient provided there are enough tutors to support the online writing lab. After all, students at this level will still struggle with producing academic English and accordingly will need much guidance and attention.

Finally, the third strand in the BIHE curriculum consists of English-Farsi courses. As students are becoming more prepared for English-medium instruction, some Farsi-speaking professors in the BIHE home country start adopting English-based textbooks. These are a small number of faculty, most of whom have received their education in an English-speaking country. Such courses start when students are minimally prepared to handle academic readings, which occur on the fourth semester of the curriculum for the students who started from EFL 100. English-Farsi courses must be cognitively undemanding, according to Cummins's (1981b) definition: introduction courses or courses that share much common vocabulary in both English and Farsi, such as computer engineering or math courses. All interaction in these courses is done in Farsi. This way, students can always ask their professors to clarify challenging concepts in Farsi. Students complete written assignments in Farsi. Thus, these courses provide extra exposure to English through receptive skills (reading and possibly listening), while students are still working on more cognitively demanding productive skills (writing and possibly speaking) in their EFL courses.

Conclusion

Distance education is no longer a novelty. It is now reaching out to many developing and underdeveloped countries, thus making education more accessible and universal. Medium of instruction is one factor that defines this universality, and, more often than not, the preferred medium is English. Inevitably, such distance schools encounter a typical problem – preparing their target student population for authentic instruction in English. This new generation of bilingual higher education schools is unique to our time. In this respect, the author of this article attempts to contribute to the limited body of experience and literature in this interdisciplinary field and welcomes respective researchers and practitioners for collaboration and dialogue.

Acknowledgement

The author would like to thank Dr. Linda Evans at the University of South Florida as well as the faculty and board members of BIHE for their guidance and collaboration on this project.

References

American Distance Education Consortium. (2003). ADEC Guiding Principles for Distance Teaching and Learning. Retrieved November 26, 2006, from the ADEC website: www.adec.edu.

Baha'i Institute for Higher Education. (2008). Retrieved March 20, 2008, from the BIHE website: http://www.bihe.org.

Brinton, D. M., Snow, A. M., & Wesche, M. B. (1989). The UCLA freshman summer program: Adjunct language instruction. *Content-based second language instruction*. Ann Arbor, Michigan: The University of Michigan Press.

Brinton, D. M., Snow, A. M., & Wesche, M. B. (2003). *Content-based second language instruction*. New York: Newbury House Publishers.

Burger, S., Wesche, M., & Migneron, M. (1997). "Late, late immersion": Discipline-based second language teaching at the University of Ottawa. In R. K. Johnson & M. Swain (Eds.). *Immersion education: International Perspectives* (pp. 65-84). New York, NY, U.S.A.: Cambridge University Press.

Casanave, C. P. (1995). Local interactions: Constructing contexts for composing in a graduate sociology program. In D. Belcher & G. Braine (Eds.), *Academic writing in a second language: Essays on research and pedagogy* (pp. 83-110). Norwood, NJ: Ablex.

Chappell, E. R., & de Courcy, M. C. (1993). Using immersion to train primary school teachers of French in Australia. *The Canadian Modern Language Review, 49*(2), 316-337.

Cummins, J. (1981a). Age on arrival and immigrant second language learning in Canada: A reassessment. *Applied Linguistics, 2*, 132-149.

Cummins, J. (1981b). The role of primary language development in promoting educational success for language minority students. *In Schooling and language minority students: A theoretical framework* (pp. 3-49). Los Angeles: California State University, National Evaluation, Dissemination and Assessment Center.

Edwards, H., Wesche, M. B., Krashen, S., Clement, R., & Kruidenier, B. (1984). Second-language acquisition through subject-matter learning: A follow-up study at the University of Ottawa. *The Canadian Modern Language Review, 41*, 268-282.

Hauptman, P.C., Wesche, M. B., & Ready. D. (1988). Second-language acquisition through subject-matter learning: A follow-up study at the University of Ottawa. Language Learning, 38(3), 433-475.

Jegede, O. (2000). The wedlock between technology and open and distance education. In T. Evans & D. Nation (Eds.), *Changing university teaching. Reflections on creating educational technologies.* London: Kogan Page.

Indiana Higher Education Telecommunication System. (1999). Guiding principles for faculty in distance learning. Retrieved November 26, 2006, from the IHETS website: www.ihets.org.

Leki, L., & Carson, J. (1997). "Completely Different Worlds": EAP and the writing experiences of ESL students in university courses. *TESOL Quarterly, 31*(1), 39-69.

Madyarov, I. (2009). Designing a workable framework for evaluating distance language education. *CALICO Journal, 26*(2), 290-.

Phipps, R. & Merisotis, J. (2000). Benchmarks for Success in Internet-based Distance Education. Retrieved November 25, 2005, from http://www.ihep.com/Pubs/PDF/Quality.pdf.

Starfield, S. (2001). 'I'll go with the group': Rethinking 'discourse community' in EAP. In J. Flowerdew & M. Peacock (Eds.), *Research perspectives on English for academic purposes* (pp. 132-147). Cambridge: Cambridge University Press.

Western Cooperative for Educational Telecommunications. (1995). Principles of good practice for electronically offered academic degree and certificate programs. Retrieved November 26, 2006 from the WCET website: http://wcet.info/services/publications/balancing/principles.asp.

White, C. (2003). *Language learning in distance education.* Cambridge, UK: Cambridge University Press.

About the Author

Irshat Madyarov holds a Ph.D. in Second Language Acquisition and Instructional Technology from the University of South Florida. His research interests include bilingual education, English for academic purposes, distance education, and foreign language assessment, foreign language teacher training. He is currently an adjunct instructor at the Baha'i Institute for Higher Education, Iran.

Irshat Madyarov,
Ulitsa Shirokaya 2,
Apt. 75, Kazan, Russia, 430030,
tel. +7(843) 520-6027, e-mail: imadyaro@mail.usf.edu

Editor's Note: Instructional design continues to be explored as a means of optimizing the learning experience. It requires integration of what we know about the learner, what needs to be learned, and how proficiency is measured. At the end of the day we test performance and gather data on learner perceptions. Performance data tells us "how effective was the learning?" and "how well were performance criteria achieved?" Learner perceptions can be helpful in interpreting results and identifying areas for improvement. If students evaluate their own learning, this is perceived learning and not performance evaluation. Such data is subjective and additional research is needed for confirmation.

Designing Online Learning Environments for Distance Learning

T. A. Weerasinghe, R. Ramberg, K. P. Hewagamage

Sweden and Sri Lanka

Abstract

The design of an Online Learning Environment (OLE) and presentation of content in a distance educational programme is a major factor in success or failure of the learning programme. The role of instructional designers who design online learning environments for distance learning programmes has become demanding. In order to support instructional designers to do their work effectively, they are provided with instructional design guidelines. However, most of these guidelines are not specific nor easily applicable. Therefore, we were motivated to create sets of easy applicable instructional design guidelines. We selected an OLE which was already reported as successful in achieving learning effectiveness and student satisfaction. We gathered students' experiences on using the OLE for their studies and analysed the data to find what design components of the OLE has led to the learner satisfaction, what design strategies used to design the learning content and design features of it led to the learning effectiveness and whether there was a relationship between students' learning style preferences and students' learning design preferences. The findings of the data analysis were presented as guidelines for instructional designers of online learning materials for novice online learners in distance learning programmes. on computer applications and information technology.

Keywords: instructional design guidelines, online learning, distance learning programme.

Introduction

Instructional designers can design learning content with media elements like text, images, videos, audio clips and animations and learning environments can be designed with components such as interactive learning content, activities, discussion forums and quizzes. It is instructional designers' responsibility to design learning components and learning contexts with appropriate media elements to facilitate learning (Tessmer & Richey 1997). However, it is difficult to design online learning materials for distance learners who are not supposed to have regular contacts with teachers. Instructional designers need to design the learning material not only with target subject content to be studied alone but also with appropriate guidance and support that learners require to do their studies successfully. Also, some researchers claim that most of the e-learning programmes fail as a result of their poorly designed learning materials (Bork & Britton Jr., 1998; Ismail, 2002). This implies that the design of an OLE and its content can result in success or failure of the learning programme and the OLE through which the learning programme is delivered. Successfulness of an OLE can be measured by the students' satisfaction towards the OLE (Levy 2007) and the effectiveness of the OLE in helping students to achieve their learning objectives and score high marks in examinations. Therefore, it is important to study the design components and features of well designed learning materials of distance learning programmes that lead to student satisfaction and learning effectiveness.

There are different findings reported on in the e-learning literature regarding components and features of online learning environments that lead to learner satisfaction and learning effectiveness. For example, Rovai and Barnum (2003) report that student satisfaction and students' perceived learning can be significantly influenced by using strategies that promote active online interactions whereas Ecom, Wen and Ashill (2006) report that they could not find any positive relationship between interactions and students' perceived learning.

Other than the course components and design features, student' learning style preferences can also have an impact on both student satisfaction (Piccoli, Ahmed & Ives, 2001) and learning effectiveness (Kim & Sonnenwald, 2002) in an online learning environment. Therefore, it is important to consider students' learning style preferences in designing and delivering online courses (Bostrom et al., 1990). Smith and Woody (2000) suggest that inconsistencies between different reports in the e-learning literature on effectiveness of multimedia instructions may reflect the interaction between the teaching styles and learning styles. When students are not taught but are supposed to learn by themselves, they have to learn with the media and instructions on the distance learning material. Therefore, instructional designers need to know which design components and media elements should be designed for learner satisfaction and learning effectiveness of students having different learning style preferences. Also, instructional designers will find it more useful if findings of design experiments in online learning environments can contribute to form instructional guidelines to help the instructional designers.

The existing literature provides guidelines to design e-learning materials (e.g. Brown et al., 2002; Goodyear, 2001; Young, 2003). However, Grabinger (1993) reveals that there is a need for empirically based set of instructional design guidelines to facilitate learning. Further, based on a study Grabinger recommends three general guidelines; 'provide macro level organisation' (organizing the elements on the template), 'use structure to create micro level of organization' (use a structure to arrange the learning content on the interface) and 'provide visual interest'. However, these guidelines lack specific information that an instructional designer can easily follow. Also, they do not specifically target at designing OLEs for learner satisfaction and learning effectiveness. Therefore, a contribution to the field of instructional design would be to provide sets of easy applicable instructional design guidelines with specific information for instructional designers designing OLEs for learner satisfaction and learning effectiveness.

In a previous paper we reported about an OLE which was successful in achieving learner satisfaction and learning effectiveness (Weerasinghe et al., 2008). In this paper we discuss the design features, components of the OLE and design strategies used to design the OLE which led to its successfulness as perceived by the students. Therefore, this paper attempts to contribute by providing comprehensive and easy applicable sets of instructional design guidelines to instructional designers designing online learning materials for novice online learners following distance learning programmes involving computer applications and information technology.

Design of an Online Learning Environment

University of Colombo School of Computing (UCSC), Sri Lanka conducts an external degree programme called Bachelor of Information Technology (BIT). UCSC does not provide any face-to-face teaching to the BIT students and in order to provide necessary guidance and support UCSC introduced an OLE through a Learning Management System (LMS) at http://lms.bit.lk/lms/. UCSC needs to improve this OLE to provide the necessary support that the BIT students require to complete their degrees successfully. Therefore, the goal of designing our OLE was to achieve learner satisfaction and learning effectiveness where learner satisfaction was measured with learners' attitudes towards the OLE and the learning effectiveness was measured with how well students could score marks at the examinations by using only the OLE for their studies.

The students' learning experiences presented in this paper were obtained with respect to the learning contents designed and developed for a rather practical subject of a course in the 1st Semester of the BIT programme. The learning objectives targeted at the skills and the knowledge enhancement of using Dreamweaver application to design and develop Web sites. For example learning content on how to create a hyperlink using the Dreamweaver application software was targeted for students' to achieve necessary skills to create hyperlinks using tools available in the application. On the other hand, to discuss the importance of creating light weight content for web sites, students needed to acquire some knowledge in using the OLE.

Theoretical Perspectives for Designing the Online Learning Environment

The online learning materials were systematically designed and developed according to an e-learning content development process which was defined based on a well known instructional system development (ISD) model, ADDIE (Analysis, Design, Development, Implementation and Evaluation) (Weerasinghe et al., 2007). The content development process affirms that online learning content should be designed according to some sets of design principles. This paper presents those design principles as design guidelines.

Design guidelines of the OLE were inspired by the principles of the three main directions of learning theories; behaviourism, cognitivism and constructivism. Behaviourism and cognitivism both support structuring of the learning content in small sections, preparing learning objectives and measuring students' learning achievements based on those predefined objectives (Mergel, 1998). If principles of only these two objectivist theories are considered in designing of online learning content, then the online learning content is assumed to perform as a teacher whose job is to transfer the knowledge to the learners (Phillips, 1998). According to Phillips, the learners in an objectivist learning environment are considered as 'empty vessels'. Therefore students in an OLE are not supposed to bring new ideas and construct knowledge by actively involving in the OLE.

Learning environments which actively involve learners in constructing their knowledge through their own experience are designed according to the principles of constructivist learning theories. With constructivism, pre-defined learning objectives are not always predictable and learning is more open to the students (Mergel, 1998). Therefore, learning activities in a constructivist OLE do not aim to achieve a predefined set of learning objectives and it is difficult to design assessments and grade students' learning achievements in a constructivist OLE.

The design of our OLE was further supported by Gagne's nine events of instruction; gaining attention, informing the learner of the learning objectives, stimulating recall of prior knowledge, presenting the stimulus material, providing learning guidance, eliciting the performance, providing informative feedback, assessing the performance and enhancing retention and transfer (Gagne et al., 2005) which were derived from the principles of objectivist theories of learning (Mergel, 1998). By referring to many learning and instructional design theories, Merrill (2002) has reported five fundamental prescriptions for effective instruction (Learning is promoted when learners engage in a task-centred instructional strategy, observe a demonstration, apply new knowledge, activate prior knowledge or experience and when learners integrate their new knowledge into their everyday world.). We found that those prescriptions closely relate with our reasoning of promoting learning in the OLE. Also, our design ideas were nourished by the perspectives of problem based learning and inquiry based learning activities implemented on social constructivist learning settings. However, we did not confine to any particular learning or instructional design theory and we did not use any particular instructional design model in designing the OLE and its content.

Learning Styles

There can be learners with different style of learning in an OLE. A student's learning style preference can be a significant factor contributing to his/her academic achievements (Cassidy & Eachus, 2000). Therefore, understanding of learning style preferences of students help to design courses to facilitate learning of individual students (Peng, 2002). There are different models to characterise learning styles. Peter Honey and Alan Mumford developed a learning style model with four categories based on Kolb's learning style theory (Chapman, 2003). The four categories of learning styles are called activist, theorist, reflector and pragmatist. According to the explanation done by Honey (2007);

- Activists like to learn by doing. They like to take challenges and experience new things. They try out exercises or participate in activities without thinking of the consequences.
- Reflectors learn by observing and thinking about what happened. They listen carefully to everyone, think over all ideas and repeat the learning when they get a chance to do it.
- Theorists like to see concepts, models and the overall image of the lesson. The content needs to be presented in an order and explained from the simple things to details.
- Pragmatists learn best when they are given a chance to practice what is immediately demonstrated or explained. They enjoy experimenting with new ideas.

Learning Style Questionnaire (LSQ) is an instrument developed by Peter Honey and Alan Mumford to find the learning style preferences of the learners. It has been used and commented as a valid and reliable learning style questionnaire by many researchers (e.g. Allinson & Hayes, 1988; Fung et al., 1993; Owens & Barnes, 1992). LSQ has two versions; one with 80 questions and the other one with 40 questions (40-item LSQ). According to Honey (2007) 40-item LSQ is designed for young learners who are not in managerial roles. The majority of the Bachelor of Information Technology (BIT) students who participated in this study belong to the age group of 20-25 years. Therefore, we decided to use Honey's and Mumford's 40-item LSQ to identify the students' learning style preferences.

The online learning content was designed to support learners having any of the four different types of learning styles; activist, reflector, theorist and pragmatists. For example, note pages with full textual descriptions were linked to the main interfaces to support the theorists and activity pages having activities based on the learning content were linked to the main interfaces to support activists.

Instructional Design Guidelines used for designing the OLE and its content

The design of the OLE and its content was done focussing on three main aspects; structure of the learning content, presentation of the learning content with multimedia, and the design of the learning activities and evaluations. In order to help instructional designers in designing the online learning content UCSC introduced a set of instructional design guidelines for each of those focal aspects. The guidelines were formed based on the previous experience of the UCSC in designing online courses and teaching for several years using OLEs.

Structuring Learning Content:

The learning content was analysed and the learning objectives were defined at the beginning of the instructional design process. The learning content was structured and constructively aligned with the learning objectives according to the following set of guidelines.

- Display the learning outcomes of the course at the beginning of the course and display the learning objectives of each section at the beginning of its section content - Learning outcomes of the course were shown to the learner on top of the menu page which was

named as 'Topic Outline' (Figure 1) which listed links to access the course sections. A course section contained lot of sub-sections and the learning objectives of a section were displayed on top of the list of its sub-sections.

- Order the learning content according to the syllabus - The students received the syllabus once they registered for the semester. Therefore in order to make them easily find the learning content that they wanted to study, the learning content in the OLE was organized according to the order of lesson titles in the syllabus.
- Further divide the learning content into small units and place them on an appropriate navigational system - Usually learners start learning with a wide-angle view of the learning content that lacks detail information (Reigeluth et al., 1980). Therefore, we organized the learning content from general to detail using hyperlinks. When a student clicked on a sub-section title on the Topic Outline page, it opened a window with three frames showing a list of unit titles on the left frame, the learning content of a unit on the right frame (Figure 2) and site name and main navigation on the top frame. A unit could contain the Main Interactive Learning (MIL) content page, one or more activity pages and note pages, and several Interactive Learning Content (OIL) pages that contain detailed descriptions of content on the MIL page.

Figure 1: Topic Outline page

- Add activities to each unit of the learning content - Activities were designed for each unit of the learning content. The students could access an activity page by clicking on the activity button (Figure 2) on the appropriate MIL page
- Add at least one quiz to the end of each section of a course - The students could evaluate their learning achievements after completing a section of the course. There was a link on the 'Topic Outline' page at the appropriate course section to access its quiz.
- Add discussion forums and chat rooms where required - The students could access the forums and the chat room of the course section from the hyperlinks on the Topic Outline page.

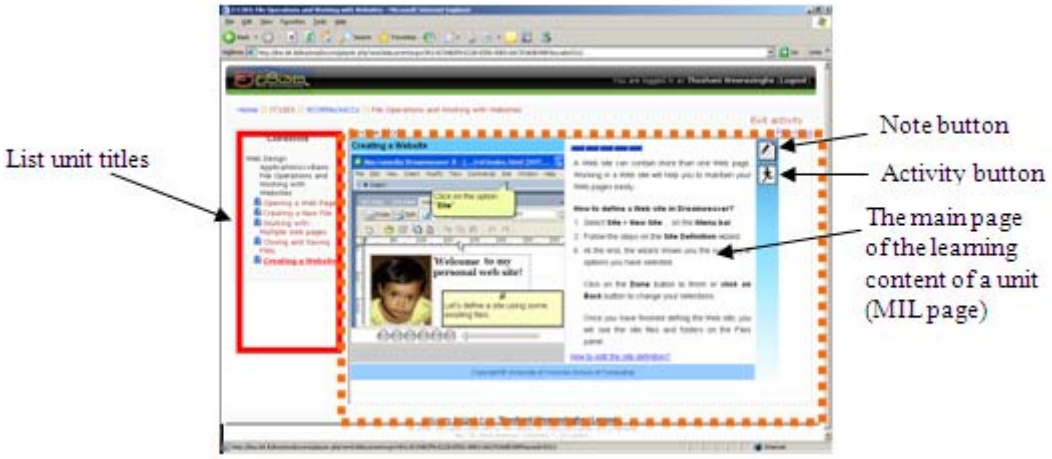


Figure 2: User interface with interactive learning content

Presenting learning content with multimedia:

The interactive learning content was designed with contexts having features of the "real world" settings (Jonassen et al., 1995) and they were built with different types of media like text, graphics, audio and animations. They were used to gain attention of the learners, present learning objectives and the learning content as described in Gagne's events of instructions and to design demonstrations and simulations which made students engaging in task-centred instructional strategies as described in Merrill's prescriptions for effective instructions.

Text:

Stemler (1997) notes that in designing computer based learning content the designers should consider that people read text on a computer screen 28% slower than that on a paper. Therefore, if we place lots of text on one page, the learners have to keep their eyes on one page for a long time and that may strain their eyes. Also, normally learners tend to print out the lengthy text and read them offline rather than reading them online. Therefore, if we need to make learners study the learning content online, we need to limit the amount of text that we place on one page and design the text to make them easily readable. Following are the set of text design guidelines that we used to design our text content.

- **Limit the amount of text on one page**. We extracted the most important text needed to deliver the message to the learner from the student manual. This was used to design the text on the interactive learning page.
- **Divide the text area into blocks of text as needed**. To make text content easily readable, we divided the text into blocks and kept enough space between blocks of text.
- **Use lists to present text if possible, otherwise design text in short paragraphs**. Usually learners make short notes in lists and that help them to easily read and remember the notes. Therefore, we preferred to design the text in lists. However we used short paragraphs in places like introductions where explanations should be included. We defined a rule to design text in paragraphs which includes, use not more than three lines of text in one paragraph and use short sentences.
- **Use simple English language**. The learning content was designed for Sri Lankan students whose first language is not English. Therefore, we used simple English language to design the instructions in the online learning content.

- **Use a tool tip to explain the technical/scientific terms used in the text area**. Technical or scientific words or phrases on the online learning content were explained in tool tips (pop up text label) linked to the relevant words or phrases.
- **Bold key words**. We bold the key words in the text content to make them easily identified and readable. Text on the online learning content was mainly designed in black and different sizes of text were used to differentiate the titles from normal text.

Selecting or deciding media elements/clips:

The media elements should be carefully used in meeting the pedagogical requirements of the course. Designers of online learning content add audio clips with narrations to their learning materials to support the learners who have already got used to *learn by listening* which is basically practiced in schools. However, the results of a study conducted by Kim and Gilman (2008) imply that simply adding narrations in voice does not enhance learning from visuals. Also, adding audio clips to content makes the learning material heavy and causes access problems. According to Nah (2003) Web users' tolerable waiting time for information retrieval is approximately two seconds and according to Galletta (2004) if designer's goal is to motivate learners to continue their studies in the OLE or revisit the OLE, then the download time should be kept below 4 seconds. Therefore, it is important to design light weight content for Web-based instructional material. Berge (1998) reports that text and graphics can be accessed easily over low bandwidth networks. Our OLE was designed specially for the students in Sri Lanka where students have less computer facilities and poor network bandwidth (Gunawardana, 2005) Therefore, narrations in voice were not added to the online learning content. The learning content was presented using text with animations or graphics (Figure 3). In order to avoid accessibility problems that can be caused by having heavy files, we agreed upon a weight limit for all media elements selected or designed to have in the online learning environment. Other than that, the instructional media for the online learning were selected based on the following set of guidelines.

Figure 3: a page with a simple animation

- Check whether a simple graphic can clarify the meaning of the text - Graphics can be used to create interest, promote learning and simplify communication.
- If not, add/design a Flash animation to simplify meaning of the text - Animations for presenting learning content should be used only where animations are essential.
- Check the database for available media elements before designing a new one - It is important to maintain a repository of media content used to design the learning content. That helps the design team to share and reuse what it produces.

Graphics:

Graphics were used to design the online learning content to create interest in learning and also to simplify the meaning of text. Lee and Boling (1999) report that simple and clear images are more effective for instruction and they can prevent loss of learner motivation while studying with the computer. Other than that we used the following set of guidelines to design the graphics in our online learning content.

In order to make the information on graphics clearly identified by the students;

- Use the example on the foreground and non-examples on the background
- Use bright colours to clearly show foreground picture while keeping the background in light colours
- Use design effects to highlight the idea you want to transfer to the audience
- Label the parts of the picture where necessary with clear text
- Do not keep illegible or unnecessary text on graphics - When reusing images having text, we need to remove the text if that text is not needed for the new learning content. Text on some images may become illegible when we resize the images for the new design work and we should remove them from the images or replace them with readable text before inserting them to the learning material.

Sometimes we create or find graphics with text on the background and if we place them along with the text content on the learning material, the leaner may find it difficult to read the text. Also, Gestalt theory states that text and graphics should have sufficient difference to make them easily identified separately (Leflore, 2000). Therefore, we have to,

- Add picture borders if a picture also contains some text or change its background colour to a different colour which will not negatively influence the clarity of the text on the image or on the text area of the learning material.
- Keep some space between graphics and the surrounding text

Animations:

Images can be used to design animations. However, that may exceed the weight limit of the file that the students can access. Therefore, images which are used to design animations should be carefully selected.

We used Flash animations to gain attention, demonstrate flows of information, create simulations and to handle the learner-content interactions where animations were necessities to design the learning context. They were designed according to the following set of guidelines.

- Keep the animation as simple as possible
- Add user control buttons (Stop, Play, Replay, Pause, etc) where necessary
- Do not make your animation play in a loop. Add a replay button to the end of the movie.

Interactivity handling:

Animations can be designed to handle interactivity and according to Dewald et al. (2000) interactivity handling is “key to active learning and reinforcement” (p. 38). However, animations can be heavy and may not be desirable for designing interactivity needed for some types of learner-content interactions. Therefore, we defined the following set of guidelines and followed them in handling the learner content-interactions in the online learning material.

- Check whether a simple script can handle the interactivity

- If not add/design interactivity using Flash animations
- Check the database for available media elements before designing a new one

Designing Learning Activities and Evaluations:

The interactions on the OLE can be designed to make it highly student-centred (Harasim, 1989). Most of the interactions in our OLE were designed associated with learning activities, quizzes and discussion forums.

Activities:

There were two main types of learning activities; activities designed on activity pages and activities designed based on forums. A learning activity on an activity page was designed based on the learning content of the course unit to which it belonged. That type of activity provided an opportunity for the learners to immediately apply new knowledge that they gained from the learning. Activities designed based on the forums were designed having at least some relevancy to the content discussed in a sub-section of the learning content. The instructional design of those activities was inspired by the problem-based learning tasks. They helped learners to apply or integrate new knowledge into the contexts outside the OLE and also to discuss with other students and teachers. The activities were designed according to the following set of guidelines.

- Check whether it helps students to achieve their learning objectives - It was important to make sure it addressed one or more than one learning objectives of the lesson because, we designed the learning evaluations to target the learning objectives.
- Design different types of activities - Different types of interactive learning activities were designed using Flash animations and JavaScript or forums in the LMS.
- Divide complex activities into simple small activities if possible - Complex learning activities were provided through scaffolding where at the beginning of a lesson the activities were provided with guided or help text (Figure 4a) and at the end of the lesson the activities were provided without guided or help text (Figure 4b). These types of activities were given in steps (set of small activities).

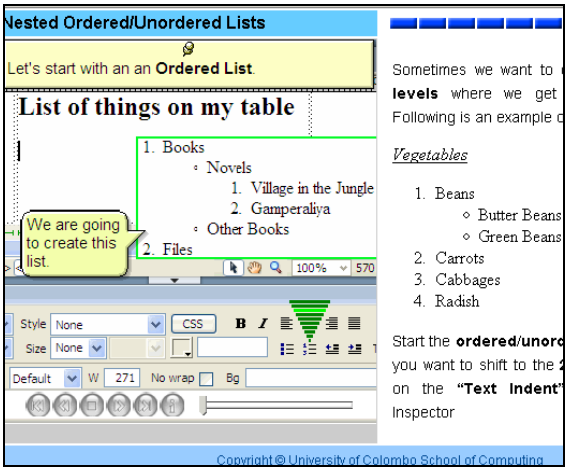


Figure 4a: Practice simulation with guided text

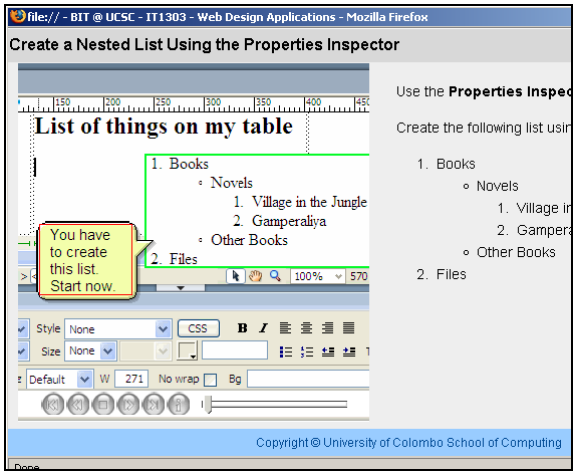


Figure 4b: Activity simulation without guided text

- If completion of one activity leads to another, place both of them on an internal navigational structure.

- Give clear and appropriate instructions – The students should be able to clearly understand what is expected from them (what they should do as a whole and what they should post to the LMS). However, if students had questions regarding the activities they could discuss them with others using forums.
- Add guided or help text where appropriate – If a learning activity was designed based on a simulation, we added guided or help text to motivate the learners to complete the activity. Activities which might need further clarifications for individual students were designed based on forums (Figure 5a) and students could ask questions and get help from other students and the teacher.

Figure 5a: Activity forum

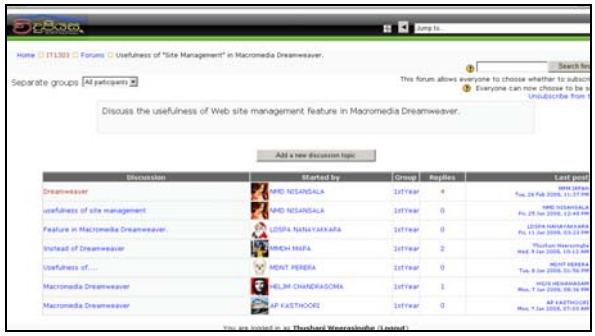


Figure 5b: Discussion forum

- Add relevant feedback for the students' interactions - Students in an OLE need to receive feedback to their responses. Therefore, we added automatic feedback to most of the activities. The activities which led to learner-learner interactions and learner-teacher interactions where students could receive feedback from the teacher and the other students were designed based on forums in the LMS.

Other than activity forums we had discussion forums (Figure 5b) which provided a discussion topic. The students had to learn by expressing ideas, commenting on others' ideas, asking questions and replying to others' questions with respect to the topic in the discussion forum.

Evaluations (quizzes):

We attempted to constructively align interactive learning content on the course units, activities and other components of the OLE with the relevant learning objectives. In order to determine whether students achieved the desired learning objectives, we created quizzes with a set of multiple choice questions. Those quizzes provided an opportunity for the students to evaluate their learning achievements by themselves.

Our instructional designers did not have much to do in designing the quizzes. The subject matter expert (course coordinator or the person responsible of providing teaching materials to the instructional designers) provided the questions for quizzes and assignments. The instructional designers added them to the LMS. However, in designing a quiz we need to:

- Use only the questions given or accepted by the subject matter expert
- Place the quiz at the end of each course section
- Added relevant questions - The questions on a quiz should be based only on the course section where it is placed.

Student Experiences of Using the OLE

In a previous paper we reported that students were satisfied with the OLE and managed to learn more efficiently using the OLE once they were used to it (Weerasinghe et al., 2008). Also, the results reported on in that paper implied that the OLE could support learners having different learning style preferences. In this paper we report; (1) what design components lead to the student satisfaction towards the OLE and its content, (2) what design features and strategies lead to the learning effectiveness as perceived by the students and (3) whether there is a relationship between students' learning styles and their learning design preferences.

The students' experiences were gathered using debriefings and four types of questionnaires;

1. **LSQ:** 40-item Learning Style Questionnaire obtained from Peter Honey and Mumford publications- Students rated a set of 40 statements. Each statement asked whether the student agreed or disagreed with it. (The same questionnaire and the result set reported on in our previous paper.)
2. **LEEQ** (Learning Environment Evaluation Questionnaire): A questionnaire addressing specific attitudes of students towards facilities and features in the OLE and the LMS.
3. **LCEQ** (Learning Content Evaluation Questionnaire): A questionnaire targeting students' experience and attitudes towards the elements of interactive learning content such as graphics, animations, simulations and activities.

LEEQ and LCEQ were developed by the authors of this paper and they consisted of questions on a Likert Scale, dichotomous questions, filter or contingency questions and unstructured or open-ended questions which made the students write any comments freely.

The students' learning experiences reported on in this paper were gathered from three face-to-face meetings; two meetings during the semester and one after the final examination. The LSQ was distributed among the students during the 1st meeting as reported in a previous paper (Weerasinghe et al., 2008). The students who expressed their willingness to participate in future meetings were invited for the 2nd and the 3rd meetings. Only 27 students participated in all three meetings. Among them, there were 9 females and 18 males. The majority of them belonged to the age group 20-25.

The students answered the LEEQ and participated in the debriefing session at all three meetings. At the 3rd meeting students answered the LCEQ as well.

The 1st author of this paper played multiple roles in the design experiment reported on in this paper. She worked as the instructional designer, content developer, the author of the student manual and the teacher of the course. Another instructional designer of the UCSC who was officially responsible for the course development work helped the 1st author of this paper in packaging and uploading the learning content to the LMS.

Design components that led to student satisfaction

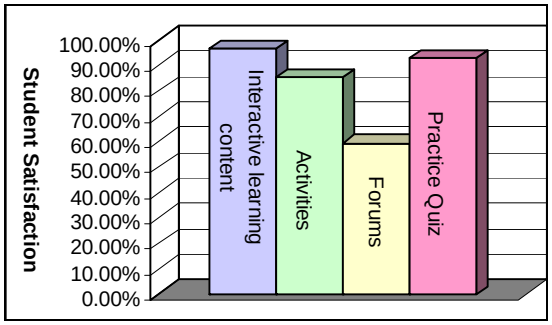
The students' reports on the LCEQ and the debriefings were used to find the design components and features that led to the student satisfaction towards the OLE.

Student experiences reported on in debriefings:

At the 1st meeting the majority of the students appreciated the OLE for delivering downloadable student manuals and providing quizzes. However, when moving from the 1st meeting to the 3rd meeting, the students appreciated the interactive learning content and the forums as much as the quizzes. At the 3rd meeting the students did not even talk about the student manuals instead they expressed their satisfaction towards the components like interactive learning content, private messaging, chat room, forums and quizzes on the OLE. They reported that those components

were quite useful in their studies. However, they added that they would have liked to have more scheduled chat sessions and audio-video content.

Student experiences reported on in the LCEQ:



Graph 1: Student satisfaction towards the components of the OLE

We drew a graph (graph1) based on the student satisfaction towards the components of the OLE reported on in the LCEQ. According to students' responses, they appreciated interactive learning content more than the other components on the OLE (Graph 1). The features of the interactive learning content were appreciated especially for their helpfulness and usefulness for learning.

Design features and strategies that led to Learning Effectiveness
(as perceived by students)

Structure of the learning content:

At the 3rd meeting the students reported on in the LEEQ that the navigation structure to access the learning content was appropriate and user-friendly. More than 70 % of the students commented that contents in OLE were properly organized on the Topic Outline page (menu page).

Design of the learning content:

About 60% of the students, who participated in the 3rd meeting, reported on in the LCEQ that online learning material had been very useful and altogether more than 96% of the students replied that it had been useful in their studies (Table 1). One student reported "Studying material gave a big help that I never expected. When there was a problem we received so many related answers from our colleagues. I would like this LMS to help us in our future studies too." Another student noted that she could apply the knowledge she obtained from the OLE in her other studies. She reported, "The LMS content encouraged us to do the BIT exam well. The LMS content was very useful for us. We could learn a lot from them. I could use the knowledge I obtained from BIT online learning content in my other exams in IT."

Table 1

Students' appreciation of design elements of the learning content

Online learning content was useful for the studies	96.30%
Learning Objectives were clear and students could achieve them	83.95%
Online learning content was useful for the studies	96.30%
Animations clarified the text content	92.59%
Animations with guided text explained the steps or procedures	85.19%
Simulations helped to study the lesson	92.59%
Graphics clarified the meaning of text	92.59%

The students' ratings for the design features of the learning content were very high (Table 1). A student who did not attend any formal teaching sessions for BIT degree courses reported "This was the first time I experienced such a learning method. As a student who totally depended on the LMS content, I regard that everything in it is good, specially the interactive learning content. It was easy to memorize facts when they were presented in lists and with interactive animations".

The students found that simulations, other animations and graphics were very helpful to them in learning the lessons (Table 1). Following are three quotes taken from LCEQ.

1. "Slides were very interesting to see. So, we could study without getting bored."
2. "Animated lessons were very good and easier to remember than studying them through notes."
3. "Interactive learning contents were very useful to understand the theories."

The text on the online learning content was appreciated for its simple language, font size and font type (Table 2). Also, the presentation of text content in lists was appreciated by the students. For example; one student reported on in the LCEQ, "OLE presented all the lessons in summaries. Therefore, we could finish the lesson quickly having knowledge about what we saw and read in the content" and another student reported "Lesson content was presented in bullets and it is useful to learn without wasting time."

Table 2

Design features of text

Simple Language	81.48%
Adequate amount of text on one page	44.44%
There was enough white space between the blocks of text	48.15%
Size of the text is appropriate	81.48%
Font type is good to read the text for a long time	81.48%

About 56% of the students found that there was not adequate amount of text on a page and 52% found that there was not enough white space between the blocks of text (Table 2). In the debriefing session students said that there were some pages that had too much text. Their comments relating to this problem referred to another course in the LMS but not to our online learning content. However, we appreciated this comment because it helped us to improve our set of instructional design guidelines presented in the next section of this paper.

Design of the Learning Activities:

The students of our OLE found that the learning activities on the OLE were quite helpful in their studies (Table 3). Also, according to our students' reports, they could be online and study using the OLE for an average of 2.5 hours per visit. That can be interpreted as that the students found learning in the OLE interesting and when the students were given autonomy for their own learning they could learn for a longer duration of time.

At the first meeting we found that there were only 26% self-studying students who reported that they did not get any formal teaching for BIT degree studies in our sample. However, at the 3rd meeting, more than 85% replied that they were already or could be self-studying students in the OLE. Also, about 96% of the students reported that they could learn actively in the OLE. In elaborating their own replies in the questionnaire, the students reported that OLE made them actively involved in learning with different types of learning activities and they could collaboratively study with other students through forums and private messages in the LMS.

Table 3

Impact of the learning activities of OLE for learning

Activities were helpful for learning	85.00%
Activities could be completed after studying the learning content	77.78%
Forums helped to discuss the learning activities	59.26%
Forums helped to discuss other learning problems	60.12%
Practice Quiz helped to evaluate learning achievements	92.59%
Could actively learn in the OLE	96.30%
Was or can be a self-learner in the OLE	85.19%
Maximum duration of learning time per visit	2.5hrs

Even though we designed discussion and activity forums we did not design any group learning activities due to administration and online facilitation problems in the BIT degree programme. However, surprisingly more than half of our students found forums helpful for discussing the learning activities with others in the LMS. Also, the students found the forums useful to discuss their problems related to learning. Following are some of the comments given by the students regarding the helpfulness of forums.

1. "Subject Discussions were helpful to share our knowledge with others and to get more opinions from them."
2. "I could ask questions from the teacher and the students."
3. "When there was a problem, we received so many related answers from our colleagues."

The students could evaluate their learning achievements by themselves using Practice Quizzes. The students reported that quizzes helped them to study the important areas of the lessons and face the exam confidently. One of the students commented, "Almost all the LMS questions were based on the syllabus. When I completed a section, I could go to the particular LMS quiz and evaluate my knowledge. That was a huge benefit to me".

LSPs and their relationship to students' learning design preferences:

The LSQ (Learning Style Questionnaire) reported that there were 8 Activists, 12 Reflectors, 7 Theorists and 5 Pragmatists in our sample (Weerasinghe et al., 2008). The students' preferences for design components on the OLE (students' learning design preferences) reported on in the LCEQ were analysed with the students' learning style preference (LSP)s. The results revealed that the students had appreciated the features of the learning content which supported their own learning styles. For example, when activists were happy about the online learning content because they could do the activities and discuss them in forums with the other students and the teacher, reflectors were happy about the animated lessons which helped them to remember the lessons more easily than the text based notes (The shaded area A in Table 4). Further, the students had requested more features or facilities that would again support their own learning styles. For example, pragmatists needed to have more support for the practical activities while theorists requested the UCSC to provide them with a search facility to find text in the learning content (The shaded area B in Table 4).

Table 4

Relationship between the students' LSPs and learning design preferences

	Activist	Pragmatist	Theorist	Reflector
I like online learning material.	Content presented in point form; could learn without wasting time	Could discuss subject problems with the teacher and other students	Could study lessons with pictures, animations and activities interestingly	Lessons in summaries; could study quickly
	Interactive learning content; very useful in our studies	Received hands on experience in using software without having it running in the computer	Interactive learning content; could solve our problems	(A) Animated lessons; easier to remember than going through notes
	(A) Could do the activities and discuss in forums	Practice quiz and activities; very useful.	The learning content; very clear and easy to understand	Could ask questions from the teacher and students
	Interesting and could complete lessons without getting bored.	Encouraged us to do the examination well.	Had all learning content	Practice quizzes; helped to study the key areas of the lessons and evaluate learning achievements
	Simulations explaining how to do the tasks	Could use that knowledge in other activities /examinations	Subject discussions; useful to share my knowledge and get more ideas from others	Had all learning content we need to study
I like to have some more features /facilities	Add more challenging activities, activities that lead to experiments and group activities	Provide more activities and quizzes	Upload all content earlier so that we can go through them several times before the exam	Upload all content earlier so that we can go through them several times before the exam
	Provide more quizzes	(B) Give more support for practical activities	(B) Add search facility to find text in the learning content	Add a help page and a guide to use the LMS

Improvements to instructional design guidelines

The student experiences reported on in this paper assert use of appropriate instructional design guidelines to design our online learning content. Further they suggested additional guidelines to enhance learner satisfaction and learning effectiveness in the future design of the OLE.

Design components that lead to student satisfaction

The results shown on Graph 1 and students' experiences reported on in the debriefings show that student satisfaction towards the OLE was led by 1) interactive learning content, 2) practice quizzes and 3) learning activities. Learner-content interactions were a major factor in those components. Therefore, results can be interpreted as that learner-content interactions led to student satisfaction in OLE and that may comply with result reported by Rovai and Barnum (2003).

Design features and strategies that lead to learning effectiveness

Structuring learning content:

The students' experiences reported on in the LEEQ assured that the contents of our OLE were well organized and placed on an appropriate navigational system. Also, the students of our OLE reported that OLE helped them to learn without wasting time. Therefore, the students' comments reported on in this paper imply that the structure and organization of the learning content on an appropriate navigational system enabled students to quickly select what they wanted to learn. However, during the debriefings the students requested the addition of:

- student guides to use the OLE, and
- contact information for student support services such as technical guidance on the Topic Outline page.

Improvements to instructional design guidelines

The student experiences reported on in this paper assert that we have used appropriate instructional design guidelines to design our online learning content. Further, they provided information for addition of more guidelines to enhance learner satisfaction and learning effectiveness in the future design of the OLE.

Design components that lead to student satisfaction

The results shown on Graph 1 and students' experiences reported on in the debriefings show that student satisfaction towards the OLE was led by interactive learning content, practice quizzes and learning activities. Learner-content interactions were a major factor in those components. Therefore, our results can be interpreted as that learner-content interactions lead to student satisfaction in the OLE and that may comply with a result reported by Rovai and Barnum (2003).

Design features and strategies that lead to learning effectiveness

Structuring learning content:

The students' experiences reported on in the LEEQ assured that the contents of our OLE were well organized and placed on an appropriate navigational system. Also, the students of our OLE reported that OLE helped them to learn without wasting time. Therefore, the students' comments reported on in this paper imply that the structure and organization of the learning content on an appropriate navigational system enabled students to quickly select what they wanted to learn. However, during the debriefings the students requested to add

- student guides to use the OLE and
- contact information of student support services like technical guidance to the Topic Outline page.

Presenting learning content with media:

Selecting media for learning:

The students' comments on the overall functionality of the interactive learning content were mainly focused on features such as learner engagement, interactivity and accessibility of the learning content. Therefore, in deciding what media is suitable for a learning content, the instructional designers should consider whether it;

- can motivate the learners
- can entice the learners
- is constructively aligned with the learning objectives
- can handle or support interactivity
- will not exceed the weight limit that the network can have.

Text:

Text in blocks having short paragraphs or lists with bold key words helped the students to go through the learning content easily and quickly. Further, the reports of our students implied that they were motivated to go through the detailed information and do the activities placed on hyperlinks. However, about half of the students of this study reported that they found too much text and too little white space on the online learning content pages in the LMS (Table 3). Therefore, we added two more guidelines to the set of text design guidelines.

- Keep one line of white space between blocks of text to increase readability
- If main page has text that cannot be easily accommodated in the available space on the template, redesign the text (Identify the key text and place it on the main page and add the other text to the links on the main page or place the text on two or more consecutive main pages).

Graphics:

More than 90% of our students found the graphics on the learning content useful for understanding the meaning of the text content. This implies that we have designed the graphics on the online learning material to support learning and it may agree with Carney and Levin (2002) who concluded that carefully constructed graphics can enhance learning from text. However, there were a few students who reported access problems of some of the graphics. This comment helped us to improve one of our design guidelines.

- Check the weight of the graphic before adding it to the online learning content. If it exceeds 500KB then split it into two using graphic-editing software and add these close to one another on the online learning content.

Animations:

Almost all the students who participated in this study replied that animations in the online learning material helped them to understand the concepts. Also, according to the students' comments, the simulations on the online learning material enabled them to get hands-on experience in using the Web-design application without even having it installed in their computers. Therefore, the students' experiences reported on in this paper can strengthen the reasoning of Syrjakov, Berdux & Szczerbicka (2000) who noted that not only the quality but also the efficiency of an e- learning material can be enhanced by using animations. However, the debriefings reported that the students needed more time to read the text on animations. Also, our students suggested that if an animation plays text, then it is important to have control buttons to allow students to control the pace. Therefore, we added two more guidelines to our set of guidelines to design animations.

- Play the text more slowly in an animation which contains text and graphics
- Design animation in steps and add control buttons to enable learners to control the pace.

Audio:

There were only a few audio files in our learning content in order to avoid exceeding the weight limit of the animation file. However, at the debriefing, the students replied that they would have liked to have audio playing with animations. Therefore, we decided to improve the last guideline in our list as follows to design the animations for online learning content.

- Add audio where necessary if it is not going to exceed the weight limit of the file
    - Add audio control buttons
    - Make sure that students without having audio playing facilities can also receive the same message in text or in text and graphics

Designing activities and quizzes:

The results we reported on in a previous paper implied that our students could efficiently use the OLE and its content in their studies (Weerasinghe, et al., 2008). Based on the analysis of student experiences we can conclude that most of the students found online learning activities (Table 3) and learning content (Table 1) useful in their studies and they could learn actively in the OLE. This implies that our students could actively construct knowledge using the OLE. Even though forum participation was not compulsory for doing the activities, more than half of our students reported that discussions with other students and the teacher via forums were useful in their studies. However, the students' reports on debriefing revealed that they preferred to have links to access the relevant forums from the interface of the interactive activity or the learning content. This leads us to add the following guideline to our list of guidelines for design of the learning activities.

- If a lesson activity leads to a forum discussion, use a link to access it from the activity.
- If there is an activity based on a lesson page or a sub-section of a lesson which leads to a forum, then give the link to access that forum within the learning content itself.
- Students' learning styles and their learning design preferences

Consider learning style preferences in designing online learning content. By analysing the students' experiences, it became clear that our students appreciated the features of the OLE with respect to their own learning styles. However, according to Honey (2007) a student can have more than one learning style preference and their learning style preferences can change over the time. Therefore, it is important to consider the requirements of the learners with different learning style preferences in designing distance OLEs.

Conclusion

An OLE which was reported as successful in achieving learner satisfaction and learning effectiveness was further studied to determine what design components of it led to the learner satisfaction and what design strategies used to design the learning content and design features led to learning effectiveness. The student experiences of learning in the OLE were gathered using questionnaires and debriefings. We analysed the data to find whether there was a relationship between students' learning style preferences and students' learning design preferences. We found that our students were satisfied with the design of the interactive learning content, learning activities and the evaluations. The students' learning effectiveness was led by the structure of the learning content, design of the interactive learning content, activities and quizzes. Also, we found that there was a relationship between the students' learning styles and the students' learning design preferences. These findings helped us to improve our set of instructional design guidelines for design of the online learning content for novice online learners, and especially for distance learning programmes, computer applications, and information technology.

ACKNOWLEDGMENT

We received help from the staff at the e-Learning Centre of the University of Colombo School of Computing to carry out the work reported on in this paper. The work presented in this paper is funded by the Swedish International Development Cooperation Agency.

References

Allinson, C. W., & Hayes, J. (1988). The learning styles questionnaire: An alternative to Kolb's inventory?. *Journal of Management Studies,* 25(3), pp. 269-281.

Berge, Z. L. (1998). Guiding principles in Web-based instructional design. *Educational Media International,* 35(2) p. 72.

Bork, A., & Britton Jr., D. R. (1998). The Web is not yet suitable for learning. *Computer*, 31(6), pp. 115-116.

Bostrom, R. P., Olfman, L., & Sein, M. K. (1990). The Importance of learning style in end-user training. *MIS Quarterly*, 14(1), pp. 101-119.

Brown, D. J., Powell, H. M., Battersby, S., Lewis, J., Shopland, N., & Yazdanparast, M. (2002). Design guidelines for interactive multimedia learning environments to promote social inclusion. *Disability and Rehabilitation*, 24(11-12), pp. 587 – 597.

Carney, R., & Levin, J. (2002). Pictorial illustrations still improve students' learning from text. *Educational Psychology Review*, 14(1), pp. 5-26. Retrieved February 4, 2009, from Academic Search Premier database.

Cassidy, S., & Eachus, P. (2000). Learning style, academic belief systems, self-report student proficiency and academic achievement in higher education. *Educational Psychology*, 20(3), pp. 307-320.

Chapman, A. (2003). *Kolb learning style: Honey and Mumford's variation on the Kolb system.* Retrieved September 2, 2008, from http://www.businessballs.com/kolblearningstyles.htm.

Dewald, N., Scholz-Crane, A., Booth, A. & Levine, C. (2000). Information Literacy at a distance: Instructional design issues, *Journal of Academic Librarianship*, 26(1), pp. 33-44.

Ecom, S. B., Wen, H. J., & Ashill, N. (2006). The determinants of students' perceived learning outcomes and satisfaction in university online education: An empirical investigation. *Decision Sciences Journal of Innovative Education*, 4(2), pp. 215-235.

Fung, Y. H., Ho, A. S. P. & Kwan, K. P. (1993). Reliability and validity of the learning styles questionnaire. *British Journal of Educational Technology*, 24(1), pp.12–21, 1993.

Galletta, D. F., Henry, R., McCoy, S., & Polak, P. (2004). Web site delays: How tolerant are users?, *Journal of the Association for Information Systems*, 5(1), pp. 1-28.

Goodyear, P. (2001). Networked Learning in Higher Education: Notes and guidelines, In *The Final Report to JCALT*, 3.

Grabinger, R.S. (1993). Computer screen designs: Viewer judgements, *Journal of Educational Technology Research and Development*, 41(2), pp. 35-73.

Gunawardana, K. D. (2005). An empirical study of potential challenges and benefits of implementing e-learning in Sri Lanka. *Proceedings of the Second International Conference on eLearning for Knowledge-Based Society*, August 4-7, Bangkok, Thailand.

Harasim, L. (1989). On-line education: A new domain. In R. Mason & A. Kaye (Eds.), *Mindweave: Communication, Computers, and Distance Education*, pp. 50-62.

Honey, P. (2007). *Learning Style Questionaire: 40-item version*, [PDF], Peter Honey Publications Ltd.

Ismail, J. (2002). The design of an e-learning system beyond the hype, *Internet and Higher Education*, 4, pp. 329-336.

Jonassen, D. H., Davidson, M., Collins, M., Campbell, J. & Haag, B. B. (1995). Constructivism and computer-mediated communication in distance education, *American Journal of Distance Education*, 9(2), pp. 7-26.

Kim, D., & Gilman, D. A. (2008). Effects of text, audio, and graphic aids in multimedia instruction for vocabulary learning, *Educational Technology & Society*, 11(3), pp. 114-126.

Kim, S. & Sonnenwald, D.H. (2002). Investigating the relationship between learning style preferences and teaching collaboration skills and technology: An exploratory study. *Proceedings of the ASIS&T Conference*, pp. 64-73.

Leflore, D. (2000). Chapter VI: Theory Supporting design guidelines for web-based instruction, In: B. Abbey (Ed.), *Instructional and cognitive impacts of web-based education*, (pp. 102–117). Idea Group Publishing.

Levy, Y. (2007). Comparing dropouts and persistence in e-learning courses. *Computers and Education*, 48(2), pp.185-204.

Mergel, B. (1998). *Instructional Design & Learning Theory*. Retrieved from February 2, 2009, from http://www2.yk.psu.edu/~jlg18/506/Instructional%20Design%20by%20Mengal.pdf

Merrill, M.D. (2002). First principles of instruction. Educational *Technology Research and Development*, 50(3), pp.43-59.

Nah, F. (2003). A study on tolerable waiting time: how long are web users willing to wait?. *Proceedings of the American Conference on Information Systems*, no. 285. Retrieved February 22, 2009 form http://aisel.aisnet.org/amcis2003/285

Owens, L. & Barnes, J. (1992). *Learning preference scales: Handbook and test master set*, Australian Council for Education Research Ltd, Melbourne.

Peng, L. L. (2002). Applying learning style in instructional strategies. *CDTL Brief*, 5(7), pp.1-3.

Phillips, R. (1998). What research says about learning on the Internet?. *Proceedings of EdTech'98*. Retrieved January 20, 2009, from http://www.ascilite.org.au/aset-archives/confs/edtech98/pubs/articles/phillips.html

Piccoli, G., Ahmad, R., & Ives, B. (2001). Web-based virtual learning environments: A research framework and a preliminary assessment of effectiveness in basic it skills training. *MIS Quarterly*, 25(4), pp. 401-426.

Reiber, L.P. (1990). Animation in computer-based instruction. *Educational Technology Research and Development*, 38(1), pp. 77-86.

Reigeluth, C. M., Merrill, M. D., Wilson, B. G., & Spiller, R.T. (1980). The elaboration theory of instruction: A model for sequencing and synthesizing instruction. *Instructional Science*, 9, pp. 195-219.

Rovai, A.P., & Barnum, K.T. (2003). On-line course effectiveness: An analysis of student interactions and perceptions of learning. *Journal of distance education*, 18(1), pp.57.

Smith, S.M., & Woody, P.C. (2000). Interactive effect of multimedia instruction and learning styles. *Teaching of Psychology*, 27(3), pp. 220-223.

Stefanov, K., Stoyanov, S. & Nikolov, R. (1998). Design issues of a distance learning course on business on the Internet. *Journal of Computer Assisted Learning*, 14(2), pp. 83-90.

Stemler, L.K. (1997). Educational characteristics of multimedia: A literature review. *Journal of Educational Multimedia and Hypermedia*, 6(3/4), pp. 339-359.

Syrjakov, M., Berdux, J. & Szczerbicka, H. (2000). Interactive web-based animations for teaching and learning, *Proceedings of the 2000 Winter Simulation Conference*, J. A. Joines, R. R. Barton, K. Kang & P. A. Fishwick (Eds.), pp. 1651-1659.

Tessmer, M. & Richy, R. C. (1997). The role of context in learning and instructional design, *Educational Technology Research and Development*, 45(2), pp. 85-115.

Weerasinghe, T. A., Nishakumari, K. M. G. B., & Hewagamage, K. P. (2007). Gap between theory and practice: Human factors in designing and developing effective e-learning materials for a structured syllabus. *Proceedings of the Fourth International Conference on eLearning for Knowledge-Based Society*. [online] Retrieved January 20, 2009 from http://www.ijcim.th.org/v15nSP3/P19eLearningAP_GepBetweenTheory.pdf

Weerasinghe, T. A., Ramberg, R. & Hewagamage, K. P (2008). Learners' satisfaction, learning style preferences and effective use of an OLE, *International Journal of Emerging Technologies in Learning (iJET)*, 3, pp. 77-85. [Abstract available from http://online-journals.org/i-jet/article/view/760]

Young, L.D. Bringing theory and practice: Developing guidelines to facilitate the design of computer-based learning environments. *Canadian Journal of Learning and Technology*, 29(3).

About the Authors

Thushani Alwis Weersinghe is a Ph.D. student at the department of computer and systems sciences, Stockholm University and the Royal Institute of Technology (KTH), Sweden. Her research area is online learning environments and she has a special interest on designing online learning environments for distance learning programmes. She is on leave for her studies from the University of Colombo School of Computing (UCSC), Sri Lanka. Before getting leave she worked as a teacher and also as a Team Leader of the e-Learning Centre at the University of Colombo School of Computing (UCSC).

e-mail: thushani@dsv.su.se. Tel: +468161668

Robert Ramberg (Ph.D. in cognitive psychology) is a Professor in Computer and Systems Sciences at Stockholm University. He is the research director of the knowledge and communication laboratory at the department of computer and systems sciences, Stockholm University and the Royal Institute of Technology (KTH), Sweden. In his research he has particularly focused theories of learning (socio-cultural perspectives on learning and cognition), pedagogy and how these theories must be adapted when designing and evaluating computer based learning and training environments. Of particular interest has been how artefacts of various kinds (IT and other tools) mediate human action, collaboration and learning.

e-mail: robban@dsv.su.se. Tel: +468164914

Dr. K. P. Hewagamage obtained his B.Sc. special degree in Computer Science (First Class Honors) from the University of Colombo and the Doctor of Information Engineering from Hiroshima University in Japan. The Professor Mohan Award for the outstanding computer science graduate in 1994, the best paper award at IEEE International Conference of Visual Languages in 1999, an award for the excellence in research by the University of Colombo in 2004 and 2006, are some of awards received for his academic activities. He has more than 60 publications in international peer reviewed journals and conference proceedings. He is a senior member of IEEE, an academic advocate of ISACA and a member of ACM. He is also current chair of IEEE Computer Society Chapter in Sri Lanka. Dr. K. P. Hewagamage is a senior lecturer in computer science and the head of the e-Learning Centre at the University of Colombo School of Computing (UCSC).

e-mail: kph@ucsc.cmb.ac.lk Tel: +94112581245

Editor's Note: In the larger scheme of education – from the editors point of view, Internet based "e-learning" may surpass print media as the primary education tool. Perhaps it has already done this in online distance learning.

Strategies for e-Learning in Open & Distance Learning (ODL)

Sunanda More

India

Abstract

The charisma of the Internet has changed the way we think, behave, do business and in recent times even the way we educate and train ourselves. Today's world has recognized the enormous potential of the Internet in almost every field of life. "Internet" has become a revolutionary word in the field of education. It is one of the most important tools in educational technology. e-Learning today is the latest buzzword in the education system. Now e-Learning is becoming popular among the young generations and in education.

e-Learning means learning by and with electronic media like Internet. e-Learning comes under the fourth learning phase of distance education. With e-Learning Open Universities can convert the present "Teacher-Centric" education system into a highly responsive and dynamic, "Learner-Centric" personalized education system. It is again "Self-paced Learning." The dream of "Quality Education, Anywhere Anytime with cost-effectiveness and at the doorsteps of learners" is possible with e-Learning. Even though Internet based "e-Learning" is considered an important tool to improve academic quality, effectiveness and efficiency of Open and Distance Learning (ODL), it will act as a back-up media or supplementary learning media, for the primary print media of learning.

With the Internet as a medium, today's learning and training is not confined to mere classroom sessions. What Web-based Learning offers is a **"**global classroom**"** wherein knowledge can be shared across geographical, cultural and psychological boundaries. e-Learning can be simply described as learning and training available through Internet or World Wide Web. It is Web Enabled Learning. It also includes education provided through CDs. It is expected that learning will be greatly enhanced and enriched by the Internet.

This effective, reliable and low cost communication system, from almost all parts of India, has opened up new innovative alternative avenues for the education offered through Open and Distance Learning.

The School of Science and Technology of Yashwantrao Chavan Maharashtra Open University, Nashik – 422 222, MS, India already initiated the first step towards the e-Learning for its "Electronics Engineering Programmes (ESEP)". This School has prepared Virtual Classroom Modules (VCMs) for some of the courses of this Programme. CD based pre-recorded VCMs from master trainers are provided to enhance and enrich the learning in the distance education mode.

The School visualized, planned and implemented various strategies to cultivate the practice of using web-based technology and Internet. This enabled faculty, Study Centre staff, and students to achieve success. Wherever necessary, corrective actions were taken and implemented with the latest technology. Faculty and students gained confidence by accepting these challenges.

Some features of the VCMs offered through Internet or CD based are listed as follows.

- Maintain learner autonomy: anywhere, anytime learning
- Best time-utilisation
- Clear and consistent knowledge communication at all levels

- Repeatability and portability
- Use of multimedia for enjoyable learning
- Value added academic services through on-line Counselling Centre
- Student Services and Feedback Centre for the information of most of student's interest and concern

This paper will describe various e-Learning components and to present key strategies used to cultivate the use of new Internet or web based technologies among the students, Study Centres, Experts, Trainers and University Staff.

1. Introduction

Today India has recognized the enormous potential of Internet in almost every field of life. Internet has created key position even in education. Emergence of new technologies helped to initiate the process of speedy and better connectivity, higher access to information and critical understanding of phenomenon. Internet has brought revolution in the field of education system. "Electronic learning" or "e-Learning" is becoming more and more popular. This is possible because of phenomenal growth of Internet in India.

Now the Internet is used not only by a very few privileged persons working in business or in the computer industry but also by the common man. There has been acceptance of this technology in almost all levels of society.

Now in the beginning of year 2009, about 40 million users in India alone will use Internet everyday. Easy, reliable and fast access to web with local phone calls, from all parts of India, is almost a reality even today. This growth is phenomenal due to Internet access that is commonly provided through telephones, mobiles, wi-fi for 24 hours and through wireless modems. This can only lead to a further major jump in the use of Internet and in the demand for institutions to provide world-class education and other services via the Internet.

- Along with the Private, Public and Industry Sectors, the Internet has created a key position even in conventional education in India.
- Numbers of educators are using Internet related aspects to deliver their courses and to reduce the problems associated with the teaching and learning methodologies.
- Government of India announced the inclusion of Information Technology (IT) as a compulsory component in the curriculum of all Polytechnics and Engineering Colleges to meet educational demands.
- Apart from professional qualifications, employers now insist on Internet literacy from the candidates in new employment and business because of worldwide job opportunities.

Ultimately this will result in a major change in basic teaching-learning methodology of conventional institutions.

2. Why Distance Learning should go to the Internet?

> *"Can you afford to ignore the millions of potential consumers who have left their television sets, newspapers and magazines in favour of spending their evenings and weekends ' surfing on the net? "*

A distance learning system has to compete with not only conventional education system but also with business companies such as Microsoft, Aptech, NIIT, Zee Education, Brainbench, etc. which are now offering series of academic programmes through the Internet leading to professional qualifications. This growing competition will be potentially threatening to ODL of India.

ODL cannot afford to ignore the increasing demand for the Internet in education. ODL has to consider internet as Magic Stick due to following few reasons.

1. The Internet is the world's fastest growing medium and capable of educating large numbers of students
2. Compared to phones, fax, and mail, the Internet is the fastest communication medium that will play a important role in ODL.
3. The Internet enhances learning due to quick, easy, powerful and timely response to users. Also, it reduces time and cost in providing services and support.
4. In ODL, with the help of the Internet, student isolation in time and geographic distance can be substantially reduced.
5. In ODL, the Internet increases the opportunities for communication.
6. The Internet provides many opportunities to enhance and improve access to education and training for people unable to attend a campus.
7. The Internet allows students to access material outside the course content.
8. The Internet attracts the students with flashy graphics, sound bytes and easy to use point and click links to other information details.
9. Asynchronous communication through the Internet allows flexibility of time and place.
10. Automatic database generation is possible with this technology.
11. Well-designed web sites and online academic programmes attract talented students, provide better training and education, and create better opportunities for employment.
12. The quality of teaching and counselling at a distance in ODL can be significantly improved via the Internet.

3. Electronics Engineering Programmes (ESEP)

Electronics Engineering Programmes (ESEP) of Yashwantrao Chavan Maharashtra Open University, was the first technical programme offered through distance mode in India. Naturally, it was quite hard for the people to believe that quality technical education could be imparted through distance education. For this reason, student enrolment hovered between 100-200 students every year from 1992 to 1996.

An experiment kit was developed to allow learner to perform many different electronics experiments at a convenient place and time. Programme implementation effectiveness was substantially improved with introduction of various managerial innovations. Curriculum was totally revamped to ensure relevance to today's industry needs. These changes initiated explosive growth in student enrolment from just about 150 students in 1996, to about 2800 students in 2001 and about 10,000 students per year in 2008. All over the state of Maharashtra, about 200 counsellors at 50 different study centres offer academic support to these students, distributed over 0.3 million km^2 (about 800 km north-south and 600 km east-west).

- Now, this is the first technical academic programme in India, offered with Internet based Learning methodology. It is believed that this programme will set standards of academic excellencebecause it uses effective programme implementation systems.

4. Learning Phases in ODL

The evolution of ODL may be grouped in following 5 learning phases, where each successive phase offers better quality as a result of features outlined above.

Zero Phases: External students without any support for study material and counseling.

First Phase: Correspondence Education with few supports for study material.

Second Phase: Self-Instructional Textbooks and minimal face-to-face counselling help at study centres (about 15-30 % of conventional education system).

Third Phase: All features of second generation ODL and additional audio video support with cassettes, radio, television and teleconferencing. *This where ODL in India stands today*.

Fourth Phase: All features of second generation ODL with additional features offered through CD or Internet with an access speed of 28.8 kbps speed. This mode is not truly "Online Education" but may be called "Web-Enabled Education". Here, minimal face-to-face counselling help at study centres is enhanced and enriched with CD based pre-recorded "Virtual Classroom Modules (VCM)" from master trainers. The Internet is primarily used as a back-up medium for CD to provide (1) text based interaction between students and counsellors, (2) formative feedback about learning effectiveness and (3) additional learning resources. Today, due to present technology limitations and cost of Internet, only this generation is immediately feasible. Infrastructure required for this generation is highly cost-effective and hence it is suitable for mass education. As use of video is kept to a minimum, it is easy to design, develop and maintain this system. *Hence, the university will implement this ODL model for Electronic Engineering Programmes in a phased manner*.

Fifth Phase: All features of fourth generation and the following additional features offered through CD or Internet with fast Internet(128 kbps or better) using ISDN or other emerging technologies. This mode will be truly "Online Education". Face-to-face counselling help at study centres may be replaced by distributed live Virtual Classroom with two-way video interaction. The Internet will be the primary media for delivery of fourth generation features with two-way video Interaction. The CD will act as a back-up medium for pre-recorded VCMs. It is estimated that, at-least 5-10 years will be required to make fifth generation practical and feasible in India. As two-way video interaction will be used, it may be difficult to design, develop and maintain this system. *Hence, although it is mentioned here as a future perspective, the university will not implement model for this generation of ODL*.

5. What is e-Learning?

e-Learning means learning by and with electronic media like the Internet. As described in learning phases, e-Learning comes under the fourth learning phase of distance education. With e-Learning Open Universities can convert the present "Teacher-Centric" education system into highly responsive and dynamic, "Learner-Centric" personalized education system. It is again "Self-paced learning." The dream of "Quality Education, Anywhere Anytime with cost-effectiveness and at the doorsteps of learners" is possible with e-Learning. Even though Internet based "E-Learning" is considered as an important tool to improve academic quality, effectiveness and efficiency of ODES, it will act as a back-up media or supplementary learning media, for the primary print media of learning.

6. Why e-Learning?

Learning can result from many different medias. Why then should one consider e-Learning? It provides access to enormous information resources that can be explored at lightning speed. Students can learn more, better, faster, and collaboratively from the latest up-to-date knowledge resources. Face-to-face teaching and learning with supportive media have time limitations that can be overcome by asynchronous learning via the Internet. "e-Learning" can help a teacher to substantially improve active participation of students by allowing them to focus on exploration, research, and dissemination of knowledge, where the instructor serves as a facilitator and guide. "e-Learning" is a system that can empower both students and teachers to achieve quality

education in an efficient manner. Teachers can clearly communicate more in less time using information rich multimedia, and especially interactive multimedia. In ODL, learning criteria (minimum quality standards) can be achieved at all study centres. In e-Learning, emphasis on print media may be reduced but not totally eliminated. The role of other media like audio, video, and interactive multimedia is substantially increased. “e-Learning” can provide freedom to students regarding place and time for learning. This flexibility makes learning an attractive activity particularly for learners who are home-bound, employed, distant from a university campus, or whose schedules do not permit regular attendance in a traditional on-campus program. Surely, ODL and the Internet will bring a clear focus on learners and thus evolve a “Learner-Centric” education system from present “Teacher-Centric” system.

7. Objectives of e-Learning

“e-Learning” can provide excellent learning support for students that is comparable to face-to-face teaching, support that is available anywhere anytime on the Internet. Master trainers will prepare, in advance, interactive multimedia presentations in modular form on the web. These presentations ensure learning effectiveness ,quality, and clarity of communication through interaction, discussions and tutorials with real teachers and fellow students. Learning will be an enjoyable experience due to master trainers and rich multimedia. This should substantially reduce the time required for learning. Textbooks written in self-instructional format for self-study are still the primary media due to convenience of use. “e-Learning” is highly cost effective without compromising quality. As broadband Internet becomes widely available, it will dominate ODL and e-Learning. The objectives of e-Learning may be summarised as follows:

1. Effective Learning,
2. Improved Quality,
3. Reduced Duration,
4. Cost Effective and
5. Flexible

8. Components of e-Learning

e-Learning consists of the following components, which are created with the state of art Internet technologies for high quality, ease of use and effectiveness.

The Virtual Classroom

Virtual Classroom modules (VCM) are “well-prepared high quality lectures” from the master trainers, with multimedia colour presentation. VCM combine distance education instructional pedagogy with latest interactive multimedia Internet technology**.** VCM helps a counsellor to efficiently perform tasks to provide information in less time, without compromising with quality. He can utilise time saved to develop higher-level mental abilities such as comprehension, application, analysis. Aand problem solving. The smaller time duration of each module (i.e. about 15 ± 5 minutes) ensures better concentration. Due to highly compressed format, about 200 VCMs, which are enough for about 2-8 courses (subjects) or 16-32 credit points, can be supplied on a single CD. Streaming media technology ensures simultaneous playing and downloading of a module from the Internet, with a negligible initial delay of about 15-30 seconds. Hence, the Internet can be used as backup media for delivery of VCMs to provide “Anywhere Anytime” learning. Use of video is kept to the minimum possible level, and normally restricted for imparting only skills. Hence, easy and fast production of good quality VCMs is possible. Discussion and/or tutorial along with a live counsellor and fellow students follow lectures at each study centre. Thus, VCM ensures best learning through distance system due to

- **Best Time Utilisation**: due to well prepared lectures from master trainers
- **Clear Knowledge Communication**: due to latest multimedia and Internet technology
- **Best Development of Understanding**: due to discussion / tutorials in a group of fellow students with a live Counsellor
- **Repeatability and Portability**: Student can repeat the module (lecture) or its part, on any multimedia computer. University can even dispatch it through Internet / email.
- **Easy Quality Assurance** as:
    - Lecture of master trainer directly reaches students.
    - Multimedia provides enjoyable and worthy learning experience.
    - Same criteria (quality standards) can be achieved at each study Centre.

The Discussion Forum

A discussion forum is an interactive web site that lets site visitors discuss topics by reading articles that have been posted, replying to articles, and posting new ones. Visitors can also use a search form to find articles of interest. The discussion forum offers asynchronous mode of communication, where messages can be prepared with editing and 'post' or 'replied" without waiting for the receiver to be ready. But it allows only text-based interaction among students, counsellors and university. Any interaction on the discussion forum is visible to all. A discussion forum can have the following features:

- A table of contents that contains hyper-links to articles in the discussion topics.
- A search form that allows visitors to search the articles for a word or phrase.
- An entry form in which a visitor types an article to be posted.

Threaded replies allow the visitor to choose whether the article being posted is a new top-level topic for discussion, or a reply to another article. This feature creates a well-classified and well-organised knowledge base about any academic or administrative topic in a short time.

- Frequently asked questions can be easily retrieved from this knowledge base.
- A confirmation page confirms that a visitor's article has been posted
- A registration form that lets visitors login to protected Web site discussions.

Online Counsellors

An "Online Counsellor" is a well-qualified and experienced person who interacts with the students, only through use of the discussion Forum and/or email, to clear their doubts/difficulties. Depending on number of students, the university will appoint one or more "Online Counsellors" for each course. Once a week, each "Online Counsellor" will answer all questions posted on the discussion forum of the respective course. He or she will also initiate academic interaction by posting (1) Home Assignments, (2) Quizzes, (3) Critical Thinking Questions or (4) Any other interesting academic information about the respective course. Online counselling will be a step forward towards "Learner Centric" education, as it provide anywhere anytime counselling for those learners who cannot regularly attend counselling sessions at the study centre for various reasons. Online counselling cannot replace regular face-to-face counselling at study centres, but only can act as a backup for it, as email and discussion forum offer only text-based communication.

Online Self-Test Centre

The Online Self-Test Centre is a dynamic web application based on an adaptive algorithm. It allows any student to directly and immediately access his own knowledge level, before or after studying any unit or VCM of the course, by taking "Self-Test" on any selected unit(s) or VCM(s) for the course. This provides valuable formative feedback about his self-study immediately. With this, each learner immediately "knows" his or her weak areas and where to concentrate learning efforts. It also lets each student know where they stand among their fellow students.

9. Key Strategies Implemented

It is difficult to introduce new technology at the institute level because of traditional thinking of most human beings. Considering this hurdle, the University decided to introduce Internet based Technology in academic programmes with a well-thought out approach and planned publicity to reach the masses. Study centres and students are the two main elements in ODL that contribute greatly in making new technologies and implementation successful. Key strategies are planned considering the interests and motivational factors from the point-of-view of students and study centres and implemented to make Internet-based education popular. They are listed as follows.

1. Large scale training was arranged for the University, Regional Centres and Study Centres staff, for better and efficient use of new technology.
2. University insisted on the use of standard Internet software across the university, its regional centres and study centres. Sufficient time was given by the University to all its study centres for the development of Internet based infrastructure.
3. A simple, well-structured, well-organised, and user friendly website was launched by the University to provide maximum, easy and high-speed access to information.
4. University selected the latest, standard software to ensure the best multimedia website.
5. University developed Virtual Classroom Modules (VCMs) on e-Learning Skills to create awareness of these technologies among the society.
6. An online (course-wise) discussion forum was prepared for professional and technical courses like Electronics Engineering and M.B.A. Programmes on which students can interact directly with the faculty at the University and the study centre.
7. Value Added Academic Services, which can arouse the curiosity among the students to use counselling centre on Internet, are provided. The worthwhile services from student's point of view are:
    i) Answers for Chapter Review Questions,
    ii) Hints for Critical Thinking Questions,
    iii) Educational objectives for the course,
    iv) How to take notes on each chapter with point, Study Guide,
    v) How to prepare transparencies, etc.
    vi) Key words for easy searching,
    vii) Links to outstanding information for further readings
    viii) Result Declaration on Internet in Mark-cum-Grade sheet format
    ix) Outstanding and latest information
8. University appointed well-qualified and experienced persons as "Online Counsellors" for each course (subject) in Electronic Engineering and M.B.A. programmes to provide value-added academic services to students and clear student doubts/difficulties expressed in discussion forums and to provoke the thinking process in the students

9. University provides Students Support Services like information related to Admission and extension of registration period, Course Exemption, Online End exam Form filling and Generation of Examination Hall Ticket , Result, Study Material, Credit Transfer, etc to the students on the respective discussion forum.
10. University prefers to communicate with the study centres on discussion forum for some programmes for quicker and faster responses.
11. Clear and well-defined maximum charges for the Shared Internet Access for both the students and the study centres by the University are an important factor.
12. University developed a Self-Test Centre for some courses of Electronic Engineering Programmes to provide feedback regarding study efforts put by the student and will motivate them for self-study.

10. Conclusion

The Internet has brought one of the biggest revolutions in the field of education. Quality and efficiency of academic and administrative services improved significantly when compared with the present status, due to fast, easy and reliable communication media. With the introduction of Internet based e-Learning methodologies, more students will come to ODL without hesitation.

With e-Learning methodologies it is believed that: Quality, accessibility and efficiency of the education will be significantly improved, which in turn substantially reduces other costs such as travelling cost and time cost. Students' rate of successful completion will be significantly improved; and skills learned and experience gained will improve their employability.

11. Recommendation

Online Distance Learning inf our country cannot afford to ignore the Internet-based learning methodologies. ODL has to switch to a combination that makes it less distant, lower in delivery cost, and accessible to students anywhere and anytime. All Open Universities should prepare for upgrading. All the Open and Distance Education Institutes in India should plan and rapidly execute introduction of e-Learning methodologies to face the challenge of new millennium.

12. Special Thanks

The author wish to express thanks to Prof. Manoj Killedar for significant contributions in conceptualisation and development of e-Learning components in the University. Prof. Manoj Killedar is Director, School of Science and Technology, YCM Open University Nashik – 422 222, MS, India

13. References

1. Greg Shaw (1998), Quality Education On-line, Conference proceedings of Asian Association of Open Universities on Distance and Open Learning.
2. Manoj Killedar (2000), Web Based Engineering Education in India, An International Distance Education and Open Learning Conference, Adelaide
3. Mike Robert Shaw, Introducing Internet into Distance Education, Conference proceedings of Asian Association of Open Universities on Distance and Open Learning.
4. Sir John Daniel (1999), Distance Learning in the era of networks, The ACU bulletin of current documentation No. 138 / April 1999.
5. Web Sites on Internet:

   5.1 http://www.microsoft.com/: Microsoft Corporation, USA

5.2 http://www.ignou.edu/: The Indira Gandhi National Open University, India

5.3 http://www.ouhk.edu.hk/: The Open University, Hong Kong

5.4 http://www.zdu.com/: ZDNet University

5.5 http://www.athena.edu/: Virtual Online University

About the Author

Mrs Sunanda Arun More is a Lecturer in Selection Grade, in the School of Science and Technology at Yashwantrao Chavan Maharashtra Open University, Nashik, since 1993. She graduated in Electronics and Telecommunication from Amaravati University in 1987. Her experience includes about 5 years in a conventional education system and 16 years as an academician in distance education. Her present interests are e-Learning, its applications and its implementations in Open and Distance Learning of India.

Email: sunandarun@yahoo.com

Editor's Note: Digital technologies have revolutionized distance learning and impacted traditional classrooms. Interactive multimedia, learning management systems, and computer-managed diagnostic-prescriptive learning with learning-objects have provided alternative solutions for quality education. Government, corporate, and academic administrators continue to question the cost-benefits. Are these the tools that will revolutionize teaching and learning in the twenty-first century? Where is the break-even point for current investments, and can we expect profits in terms of quality, accelerated learning, and elevance. Here is a view from Finland to stimulate the dialog.

Do Investments in Digital Learning Resources Pay Back?
Comparing Learning Objects and Traditional Classroom Teaching

Sami Nurmi, Tomi Jaakkola

Finland

Abstract

Nowadays resources are allocated for developing, distributing, standardizing and implementing learning objects (LOs)for the needs of schools. These investments can only be deemed worthwhile if LOs can elaborate teaching practices or have some positive impacts on students' academic performance. Hitherto there is rather limited understanding and a lack of empirical studies on the instructional value of LOs. In this paper the effectiveness of LOs on students' learning performance in mathematics and language learning was studied and compared to the traditional classroom teaching. According to the results the students using paper-and-pencil tasks in traditional classroom environment outperformed the students using drill-and-practice LOs. Implication of the results and the crucial roles of learning context and available instructional support are discussed.

Keywords*:* Learning objects, Educational Technology, Experimental study, Mathematics, Language, Traditional classroom teaching, Learning Outcomes, Educational Effectiveness

Introduction

Ever since Thomas Edison declared in 1922 that motion picture will revolutionize educational systems and substitute for textbooks, there has been a search for advanced technologies to improve teaching and learning (Bernard *et al.*, 2007). Although the role of content is not stressed in contemporary learning theories, content and the format in which it is presented is important whether learning is technology-enhanced or not (Kalz *et al.*, 2008). During the last twenty years considerable investments have been made to introduce new learning technologies and Information and Communication Technologies (ICT) into schools through acquiring computer hardware and software, developing digital learning materials, setting up network connections and providing staff training. More recently, financial resources have been allocated for developing, distributing, standardizing and implementing learning objects for the needs of schools especially in Europe, North America and Australia (see e.g. McCormick & Li, 2006; Rehak, 2006). These investments and spent resources can only be deemed worthwhile if there is evidence that ICT infrastructure and learning objects have made some positive impact on the academic performance of students, teaching and learning practices, and work load of teachers.

The impact and effectiveness of ICT in education has been studied intensively ever since early 1980s and the findings vary from highly positive and optimistic to negative and skeptical (Sclater *et al.*, 2006). However, the general trend is that technology-supported learning environments are more effective than or at least as effective as traditional instruction in terms of student outcomes (e.g. Waxman *et al.*, 2003). Recent reviews of the impact of ICT on education provide some summary findings that are interesting in the context of this paper. The EU review published by

European Schoolnet (Balanskat *et al.*, 2006) provided statistical evidence that, generally, ICT can enhance students' attainment in the primary school level. The evidence suggested that the impact is most positive particularly in science and in English as a home language, but not as compelling in all other subjects, e.g. in mathematics. In addition to the benefits on students' attainment, the overwhelming majority of the studies reviewed in the report confirmed wider positive advantages of using ICT on students' motivation, skills, concentration, cognitive processing, independent and student-centred learning, critical thinking and teamwork. It was also stated that ICT can benefit both academically strong and weak students as well as students with special needs. The Becta commissioned study of ICT impact in the United Kingdom (Condie & Munro, 2007) reported that the evidence on students' attainment is somewhat inconsistent. In mathematics, foreign languages, science, history, geography, physical education and arts ICT had positive impact. However, the evidence of ICT impacts on intermediate outcomes, such as students' motivation, engagement with and independence in learning is reported to be greater and more persuasive. Based on the ambiguous results of these reviews and other previous ICT impact studies, it is still clear that simply installing hardware and software and having access to computers does not produce desired outcomes and improved students' academic achievement (e.g. Clark, 1983), but successful and effective learning with ICT must rely on sound instructional strategies and implementation in environments that are based on contemporary learning theories.

Promises of learning objects

Although there is no consensus regarding the exact definition, learning objects (LOs) are generally understood as digital learning resources that can be shared and accessed through the Internet and reused in multiple learning contexts. Therefore the learning object concept is more about use, not the objects themselves (Parrish, 2008). The core idea of LOs is to make educational materials broadly accessible, searchable, durable, and reusable beyond their origins for different people, for different purposes, and in different contexts (Bennett & McGee, 2005; Nurmi & Jaakkola, 2006; Rehak & Mason, 2003). Littleton (2003) has summarized this vision of reusability arguing that 'LOs, produced by publishers, teachers, support staff and students themselves, would be stored in digital repositories, where they could be easily accessed, recombined and reused within online courses', and they 'would be designed so that they could be adapted to fit different educational models, subject disciplines and levels of study' (p. 2). Furthermore, an LO does not have any particular format, but a LO can, for example, be granular digital resources aimed at one specific learning objective and designed to been able to integrate, aggregate and sequenced together to form various customized 'units of learning' according to the given learning needs (Margaryan & Littlejohn, 2007).

These promises of unlimited universal access to online instructional materials, increased productivity among educators and simplified solutions for individualized learning have raised worldwide enthusiasm. It is said that LOs can fulfil the long-promised rewards of eLearning by offering means to make instruction adaptive to individual learners, generated even on the fly, and scalable for mass education without proportional increase in cost, in addition to increased collaboration between educators in terms of the sharing and modifying of available content (Parrish, 2004).

While LOs hold tremendous promise, they have also raised criticism among academics (e.g. Butson, 2003; Collis & Strijker, 2004; Lambe, 2002; Nurmi & Jaakkola, 2006; Parrish, 2004; 2008). In contrast to the above mentioned general advantages of LOs, there are also claims that eLearning can be detrimental not only to the achievement of specific instructional objectives, but also to broader educational goals ranging from brain development to social development. In these anti-computer views the claim is that ICT instruction is likely to be ineffective at best and harmful at worst (Triona & Klahr, 2003). The biggest drawbacks of a majority of LOs (due to their emphasis on knowledge transmission and drilling of learners' level of knowledge mastery)

are their underlying views of knowledge, learning and teaching which are argued to be flawed and outdated (Nurmi & Jaakkola, 2006). In the worst case, LOs can reduce teaching to content delivery and transmission, and learning to simple information acquisition and memorization neglecting learner's active role in personal knowledge construction and meaning making.

Despite the zest for LOs among different focus groups ranging from academics and educators to corporate leaders, there is still rather limited understanding of the instructional value and effectiveness of LOs (Kay & Knaack, 2007; Nurmi & Jaakkola, 2005; 2006), and questions about whether and how the LOs influence students' learning have only begun to be addressed. The majority of the LO debate is focused on theoretical ideas and technical aspects behind LOs, and empirical evidence is very sparse (Butson, 2003; Collis & Strijker, 2004). For example, in his recent review of LO literature, Kay (2007) found only two articles out of 58 that examined the impact of LOs on learning.

In the evaluation studies where users evaluate the effectiveness of LOs the findings tend to be very positive. For example, in one such study (Kay, 2007) two-thirds of the high school students answered that they benefited from using LOs, and valued most the motivational, interactive and visual qualities of LOs. Unfortunately the majority of the evaluation studies rely only on descriptive data and anecdotal reports, and are therefore lacking reliability and validity, as well as statistical analysis (Kay & Knaack, 2007). Apart from these evaluation studies, there practically are no empirical studies where LOs' impact on learning outcomes is studied rigorously. As a consequence, there exists a clear lack of strict empirical studies, making it difficult to have confidence in findings of the positive educational value of LOs. Also, without empirical evidence on the impact that LOs have on learning and analysis of the instructional aspects of LO implementation, we are at the risk of having our digital repositories filled with easy-to-find LOs that we do not know how to use meaningfully in the classroom (Agostinho *et al.*, 2004; Richards, 2002).

Therefore in this research the effectiveness of LOs on students' learning performance in two subjects was studied and compared to more traditional classroom teaching. The selected subjects were mathematics and language, because according to the previous studies those were found to be subjects where ICT can have positive impact.

Overview of the studies

This paper reports and discusses the results of two experimental studies[1] that investigated the effectiveness of drill-and-practice LOs in comparison to more traditional classroom teaching in two subjects. Drill-and-practice LOs were selected because they represent the most common LO type available at the moment (McCormick, 2008). Drill-and-practice LOs are typically rather simple game-like programs whose main aim is to transmit the content efficiently from the LO to the receiving learner. One important reason for their possible efficiency is that students, especially younger ones, are likely to be motivated and engaged by such tasks that incorporate game-like features (see e.g. Stipek, 1993), and learning motivation has found to have a direct impact on learners' learning results in online learning environments (e.g. Wang *et al.*, 2008). Due to their design, drill-and-practice LOs are mainly suitable for mechanistic skill rehearsal and fact-oriented knowledge acquisition in narrowly defined topic areas. Although these kind of LOs are quite contrary to the ideas of contemporary learning theories and have only a limited potential to encourage deeper-level understanding and knowledge construction in complex content areas, they can be very effective in some learning contexts with certain audience and content areas when

[1] Both studies were conducted as a part of Context eLearning with Broadband Technologies (CELEBRATE, http://celebrate.eun.org), a large-scale European R&D project that developed, shared and used a large number of LOs in schools across six European countries.

used appropriately. The topics in both the studies required rather mechanistic learning skills including learning of facts and rules and ways to apply them in straightforward way, and therefore drill-and-practice LO was the suitable LO type to be selected for these studies.

The first study was conducted in mathematics and the second in the Finnish language. In study I the specific topic was fractions, and students needed first to understand the concept of fraction, then to convert fractions to mixed numbers, and finally conduct simple calculations with fractions. In study II the topic was noun cases of the Finnish language, and students were required to learn specific grammatical rules and be able to use cases in a correct context. In both studies, half of the students worked individually with drill-and-practice LOs and half worked under teacher-led classroom instruction where typical paper-and-pencil exercises were completed. In order to obtain more robust evidence with a larger sample size on the impact of learning environments, the results of the individual studies were combined.

All of the used LOs were originally designed for different learning contexts, and they were reused and recontextualized to meet the needs of the specific learning environments of the studies. First the LOs were searched and selected by researchers from one learning portal, and then integrated and aggregated into the school's learning management system (LMS) to form new LO entities or 'units of learning'. Finally students individually used LOs online within LMS with a web browser.

The procedure in both studies followed the same pattern. In the first session students were given a pre-test. In order to ensure that different learning conditions within each study had the same spread of achievement – that is, students in all learning conditions were equal at the baseline – students were first classified according to their pre-test scores and were then placed evenly into learning conditions. The actual intervention phase, in which students worked in two different learning conditions, took place one week after the pre-test and lasted two hours. A post-test was administered to students one day after the intervention. The pre-test–post-test design with control and experimental conditions allowed us to evaluate the effectiveness of LOs on students' learning outcomes and their possible differences in comparison to traditional classroom teaching environments. In addition to overall effectiveness, the studies were aimed at revealing whether the environments have different effects on the learning outcomes of students with different levels of prior subject knowledge. Therefore, the level of the prior knowledge parameter was included in the analyses. The division of students into low and high prior knowledge group was based on the median split of students' pre-test scores. Also, general observations based on researchers' notes were recorded during the intervention.

In this context, the research questions investigated in this chapter were:

1. Are there differences in students' learning outcomes between LO and traditional classroom environments?
2. Are there differences between LO and traditional environment in learning outcomes of students with different level of prior knowledge?

The results are expected to provide valuable information for teachers, instructional designers and content producers as to what aspects they should consider when designing and implementing LOs in education. The details of both studies are provided in the next sections.

Study I. Mathematics: Fractions and mixed numbers

The first study was conducted with 35 10-year-old (fourth grade) Finnish elementary school students. A subject knowledge test that measured students' understanding of fractions and mixed numbers was administered before and after the intervention phase. The pre-test consisted of six different sections and each of them included several questions. The pre-test focused on

identification and marking of fractions and comparing different fractions and sorting them in size order. The maximum score for the test was six (one point for each section). The post-test included ten sections with various numbers of questions. The maximum score of the post-test was ten where each section corresponded to one point. In addition to the basics of fractions, the post-test dealt with identification of mixed numbers being more challenging than the pre-tests. The intervention phase consisted of two one-hour sessions. The teacher started both sessions in both conditions with an introductory instruction in which he presented the content to the students. After the introduction, students solved content assignments individually. Students were taught by the same teacher for both studies, in order to control the possible effect that differing teaching styles might have had. To ensure that the conditions were comparable, the assignments used in the separate classes were carefully chosen to cover the same topics.

1) In the *Learning Object* condition (n = 19), students worked in the computer laboratory with LOs (three LOs per session). The LOs covered fractions and mixed numbers and were principally quite simple 'game like' drill-and-practice programs that provided instant feedback for students' input/answers. Even though the students could proceed at their own pace, the order of the LOs was pre-determined. There was no direct teaching and no teacher-controlled tasks during and after the working phase. The LOs provided very simple feedback, indicating only whether an answer had been correct or incorrect.
2) In the *Traditional Classroom* condition (n = 16), students worked in a normal classroom. Here students individually completed different paper-and-pencil tasks concerning fractions and mixed numbers. Students were allowed to seek help from the teacher during the working phase (although they were not encouraged to do so), and at the end of the lessons, the students marked their work using answers provided to the class by the teacher.

Study II. Finnish language: Cases/grammar

The content of study II was Finnish grammar, more specifically noun cases. Cases are a vital part of the Finnish language and are considered to be very difficult to learn. The participants in the study were 37 11-year-old (fifth grade) students from average Finnish elementary schools. A subject knowledge test that measured students' understanding of cases was administered before and after the intervention phase. The pre-test consisted of three sections with multiple questions. The first section measured students' prior knowledge of cases and the second their understanding of parts of speech and the third their reading comprehension skills. The maximum score was six, and each section was weighted for two points. The post-test focused only on cases and students were required to identify the cases and inflect different words according to different cases. The post-test involved five different sections with numerous questions and the maximum score was 32. The intervention phase itself consisted of two one-hour sessions. The lessons in both conditions started with a teacher-led introduction that included collective sentence completion during which the teacher asked students to propose which cases fit in particular contexts. After the introduction, students solved content assignments individually. Again, in this study, students were taught by one teacher and the assignments that were used in both conditions were carefully chosen to cover the same topics.

1) In the *Learning Object* condition (n = 19), students worked individually in the computer laboratory with LOs containing case identification tasks. There were five LOs for both sessions. Even though the students could proceed at their own pace, the order of the LOs was pre-determined. The LOs were again simple drill-and-practice games or drag-and-drop applications that gave instant feedback or scores for each student action. As in study I, there was no direct teaching and no teacher-controlled tasks during and after the working phase, and the only feedback came from LOs.

2) In the *Traditional Classroom* condition (n = 18), students worked in a normal classroom. Here students were individually assigned to solve case identification tasks, which were to be completed in paper-and-pencil format. As in Study I students were allowed to seek help from the teacher during the working phase (although they were not encouraged to do so), and at the end of the lessons, the students marked their work using answers provided to the class by the teacher.

Results

In order to examine the effect of different learning conditions on students' learning outcomes, the students' subject knowledge post-test scores in both studies are compared. Analysis of covariance (ANCOVA), with subject knowledge pre-test as a covariate, was used to investigate post-test differences. First the results of the individual studies are introduced separately, and then the individual results are combined to get more reliable conclusion on the impact of the compared learning environments. The results of the individual studies are presented in Table 1.

Table 1

Comparison of estimated marginal post-test means between different learning conditions in the studies(post-test scores adjusted by pre-test scores)

	Mean (S.E.)	ANCOVA
Study I, Mathematics (N = 35)		
Traditional classroom condition (n = 16)	7.02 (.39)	F (1, 34) = 3.777, p = .061
Learning object condition (n = 19)	6.00 (.36)	
High prior knowledge		
Traditional classroom condition (n = 8)	7.76 (.53)	F (1, 18) = 1.394, p = .253
Learning object condition (n = 11)	6.94 (.45)	
Low-prior knowledge		
Traditional classroom condition (n = 8)	6.09 (.57)	F (1, 15) = .2.165, p = .163
Learning object condition (n = 8)	4.91 (.57)	
Study II, Language (N = 37)		
Traditional classroom condition (n = 18)	11.80 (1.37)	F (1, 36) = .894, p = .341
Learning object condition (n = 19)	9.99 (1.33)	
High-prior knowledge		
Traditional classroom condition (n = 8)	17.63 (2.57)	F (1, 15) = 2.385, p = .147
Learning object condition (n = 8)	12.01 (2.57)	
Low-prior knowledge		
Traditional classroom condition (n = 10)	7.19 (1.28)	F (1,20) = .522, p = .479
Learning object condition (n = 11)	8.47 (1.22)	

Note. S.E. = standard error of the mean.

Although students working in the traditional classroom environment slightly outperformed students in the learning object environment in both studies, the differences were not statistically significant ($p > .05$). In the study I (mathematics) students in the traditional classroom environment scored better than students in the learning object environment both within low and

high prior knowledge groups. However, in the study II (language) the learning object environment was more beneficial than the traditional classroom environment for the students with low level of prior knowledge. Among the high prior knowledge level students, the traditional classroom environment was more effective. Nevertheless, the differences between the compared learning environments within the prior knowledge groups were not significant.

As the studies were similar in their designs and required same kind of learning skills, it is possible to combine the results of the individual studies. Instead of focusing only on the results of individual studies, it is more beneficial to investigate the impact of identical parameters across the studies simultaneously. By combining the results from individual studies we increase the sample size, which enables us to make firmer conclusions on the effectiveness of the compared learning environments and detect more easily statistical differences. The Stouffer method allows combination of p-values from multiple studies and computation of an average p-value[2] for these studies (p-value is a direct function of sample size). Combined results are presented in Table 2.

Table 2

Average impact of the learning conditions across studies on students' learning outcomes.

	Study I (Mathematics)	Study II (Language)	AVERAGE
Learning object vs. Traditional classroom (N = 72)	p = .06, ES = -.64	p = .34, ES = -.31	p = .04, ES = -.47 ±.47
Low-prior knowledge (N = 37)	p = .16, ES = -.70	p = .48, ES = .30	p = .63, ES = -.12 ±.66
High-prior knowledge (N = 35)	p = .25, ES = -.53	p = .15, ES = -.73	p = .07, ES = -.62 ±.69

Learning object condition = condition in which students worked with drill-and-practice LOs

Traditional classroom condition = condition in which students used traditional learning methods and paper-and-pencil tasks.

Low and high-prior knowledge division was based on the median split of students' pre-test scores.

ES = standardized mean difference effect size (ES) with Hedges' (1981) bias correction. In other words, the mean difference expressed in standard deviation units. The basic formula to calculate ES is to first subtract the mean of $group_y$ from the mean of $group_x$ and then to divide this difference by the square root of pooled variance of these two groups (see Rosenthal, 1984, for details and formulas).

AVERAGE = Averaged results from individual studies with identical parameters. Average p-values have been calculated via Stouffer method (Mosteller & Bush, 1954; see Rosenthal, 1984). Average ES is an average effect size from individual studies when each ES is weighted by degrees of freedom (N-2) of each comparison (see Rosenthal, 1984, for details).

± = 95% confidence interval for the ES.

As can be seen that overall, there is significant difference in learning outcomes between the LO and the traditional classroom condition. The investigation of combined average results reveals

[2] In Stouffer method average 'p' (i.e. statistical probability) is calculated by a) transforming each two-tailed 'p' into one-tailed 'p', b) transforming one-tailed 'p' into a standard normal deviation Z-score (signs of Z-score should indicate the direction of an effect), c) adding Z-scores together, d) dividing sum of Z's by the square root of the number of studies, e) transforming the new Z statistic first back into one-tailed probability, f) and finally into two-tailed probability (see Rosenthal, 1984).

that the students using paper-and-pencil tasks in traditional classroom environment outperformed the students using drill-and-practice LOs ($p < .05$). But how much more effective is the classroom environment? The mean difference - expressed in standard deviation units - is called standardized mean difference effect size which is reported in the table. As a general rule of thumb, a standardized mean difference effect size (ES) of .20 should be interpreted as small, .50 as medium, and .80 as large (Cohen, 1988). If we interpret the magnitude of the effect in that way, the average difference between the means of the traditional classroom condition and the LO condition is of medium size (ES = .47) in favour of the traditional classroom group. Another useful, and perhaps more concrete, way to interpret the effect magnitude is to consider the percentage of overlap between the scores (or distributions) of two conditions. Using this logic, an ES of .47 means that 68% of the students in the traditional classroom environment did better than the average student in the LO environment.

The more detailed investigation of impact on students' learning outcomes within prior knowledge level groups shows that overall traditional classroom teaching was more effective than LOs within both low and high prior knowledge groups. However, the differences between the conditions are not significant, partly due to the fact that the sample sizes of the level groups remained small.

Discussion

Recently, considerable investments have been placed on building up ICT infrastructure and developing sharable digital learning resources for the needs of education all around the world. Although these new instructional technologies raise huge optimism and dazzle us with their promises (e.g. Parrish, 2008), these eLearning investments can only be considered justifiable if they succeed in introducing improvements on teaching practices and enhancements on students' learning outcomes in comparison to normal classroom teaching activities. However, to date there has only been sparse empirical evidence on the effectiveness of learning objects on learning performance. Therefore the main aim of this article was to investigate the effectiveness of LOs in comparison to traditional classroom teaching.

Although the individual studies did not highlight significant differences, the pooled results from both studies showed that students using traditional paper-and-pencil tasks outperformed the students working with drill-and-practice LOs. The results demonstrated that traditional classroom teaching is at least as effective as LOs in implementing expository teaching activities and fact-oriented learning behaviour. Therefore using LOs to replicate traditional teaching activities which rely on presentation, transmission, exercising, rehearsal and reproduction of knowledge does not seem appropriate.

Why were traditional classroom activities more effective than using drill-and-practice LOs in these two studies? Firstly, based on researchers' general observation during the interventions there seemed to be differences between the studied environments in the level of students' engagement. It can be concluded that students working with LOs had difficulties in concentrating on the content to be learned and the atmosphere was somewhat restless. Students seemed to be hurrying through the LOs and they were even competing who was the fastest in completing all the LO exercises. Students were also interested in solving how the LOs works, i.e. what was the logic behind given LOs, more than the learned content itself. Instead in traditional classroom environments there were not such difficulties with the students' concentration.

Secondly the available instructional support and control may have affected on the students' learning behaviour. In the classroom conditions the teacher led the class and therefore the teaching-learning activities were rather strictly controlled. The less-controlled LO environments placed more requirements on students' self-regulation and self-discipline, whereas in the classroom contexts, the teacher controlled activities. In this way, the instructional support was

slightly different in the LO condition as compared to the traditional condition. In the classroom contexts students were allowed to seek help from the teacher during the working phase, and at the end of the lessons, the tasks were collectively checked, whereas in the LO contexts students received no support from the teacher and only elementary feedback from the LO itself. These differences between the conditions in their level of control and instructional support can be a critical factor in explaining the differences in the successfulness of the learning environments.

A third possible reason may be associated with students' learning habits. It is clear that students were more accustomed to typical classroom activities with paper-and-pencil assignments. It is likely that taking advantage of technology completely requires some time and very short-term eLearning interventions are found to be predominantly ineffective, as shown in a classic review study by Khaili and Shashaani (1994). According to their findings the ICT impact increased decidedly when the intervention duration expanded from couple of days to four to seven weeks. It may be that the duration of the LO interventions in our studies was too short to reveal the real effectiveness of such environments. Furthermore, there may be inherent problems in the mechanistic learning behaviour that both studies required. Fact-oriented learning and rehearsal activities do not always motivate students enough and in addition, they cannot understand the purpose or objective of their learning, for example, learning of grammatical rules. As a result of low motivation and meaningfulness learning behaviour students' focus may have drifted away from the actual content to be learned.

The fourth explanations can relate to the game-like features of the LOs used in these studies. Although LOs' game-like features are designed to raise learners' motivation, they could also bring their own challenges and limitations. Students are accustomed to play computer games in their free time where gaming means relaxation and is entertaining. Consequently, when computer games are used in education, there easily exist discrepancies between the expectations of educators and students. Instead of using games for learning purposes, students often seek entertainment as they would in their free time gaming, and then, as a consequence, they do not regard the use of educational games as important learning situations. Students' and educators' aims can also conflict. Sometimes students may not try to achieve the actual objectives of the educational games, but are aiming for loss or negative feedback if they feel it is somehow more rewarding. For example, in our studies it was observed that students were making mistakes because they were willing to see the negative feedback within an LO as they regarded it as funny or entertaining. Based on our results on the effectiveness of game-like drill-and-practice Los, it can be argued that learning resources aiming at 'edutainment' are not effective in terms of content learning when compared to the academic performance achieved in normal classroom contexts.

However, the whole question about the effectiveness of eLearning is problematic, because research has shown that technology as such does not have any particular impact on learning, but the impact is always related to the ways of using ICT as a part of certain, emerged learning environments. Therefore, the focus of the research should be placed on the effectiveness of whole learning environments, not just on the type of eLearning technology used. LOs are just a new chapter in the story of educational technology innovations that do not necessarily lead to students to improved academic achievement (c.f. Clark, 1983). It remains evident that, in order to have effective LOs as well as all educational technology, applications require sound instructional design strategies founded on contemporary learning theories and research-based evidence. These findings highlight again the crucial significance of context. As we have found out the available instructional support is a critical factor in explaining the successfulness of learning environments. Our students in LO conditions were required to work in self-directed ways, however with more structured instructional guidance in using Los, students' learning performance could be better. As Wang *et al.* (2008) argued it is important to help and support learners to adapt to and cope with the open self-directed learning environments.

No technology is inherently good or bad, but its applications can be judged good or bad. LOs hold many promises and possibilities in various learning contexts when used according to appropriate instructional strategies, but they should not be seen as the primary or only solution for the challenges of learning (Parrish, 2008). This point is related to any eLearning innovation, since taken to its extremes any technology ends up reversing its original benefits (McLuhan and McLuhan, 1988).

Although these results did not support promises of LOs to enhance students' learning outcomes when compared to traditional instruction, there are other important elements that can be accomplished by using LOs. For example, using LOs can provide ways to enrich and diversify daily instruction practices; can develop students' technical skills and more generally, can improve their attitudes towards technology; may increase the interaction among students and/or between students and teacher; and offers possibilities to create positive learning atmosphere where students are motivated to work towards attaining desired learning objectives. However, more research is needed on the interaction between various LO types, ways to implement LOs and learning outcomes.

In addition to these learning perspectives, LOs also provide means to reuse once produced learning materials as mentioned in myriad of LO literature. However, it should be borne in mind that beside promised benefits (at least on a rhetorical level) of cost savings and quickness in lesson and material preparation through content reusability and easiness of updating (e.g. Weller, 2004), developing and implementing new learning contexts with existing LOs will always be difficult, costly, time-consuming and technically demanding (Tompsett, 2005; Wilhelm & Wilde, 2005).

References

Agostinho, S., Bennett, S., Lockyer, L. & Harper, B. (2004). Developing a learning object metadata application profile based on LOM suitable for the Australian higher education market. *Australasian Journal of Educational Technology*, 20(2), 191-208.

Balanskat, A., Blamire, R. & Kefala, S. (2006) The ICT impact report. A review of studies of ICT impact on schools in Europe. Available: http://insight.eun.org/shared/data/pdf/impact_study.pdf

Bennett, K. & McGee, P. (2005) Transformative power of the learning object debate. *Open Learning*, 20(1), 15-30.

Bernard, R. M., Abrami, P. C. & Wade, C. A. (2007) A summary of review of e-learning in Canada. A rough sketch of the evidence, gaps, and promising directions. *Horizons*, 9 (3), 32-43. Available: http://search.ccl-cca.ca/NR/rdonlyres/845D31C6-67D5-47E8-B37F-0A5FA061F06C/0/ELearningSummaryFromHorizons_V9N3_e.pdf

Butson, R. (2003) Colloquium. Learning objects: weapons of mass instruction. *British Journal of Educational Technology,* 34(5), 667–669.

Clark, R. E. (1983) Reconsidering research on learning from media. *Review of Educational Research*, 53(4), 445-459.

Cohen, J. (1988) *Statistical power analysis for the behavioural sciences* (2nd edition). (Hillsdale, NJ, Erlbaum).

Collis, B., & Strijker, A. (2004) Technology and human issues in reusing learning objects. *Journal of Interactive Media in Education*, 4. Available: http://www-jime.open.ac.uk/4

Condie, R. & Munro, B. (2007) The impact of ICT in schools – A landscape review. Available: http://publications.becta.org.uk/display.cfm?resID=28221&page=1835

Kalz, M., Drachsler, J., van Bruggen, J., Hummel, H. & Koper, R. (2008) Wayfinding services for open educational practices. *International Journal of Emerging Technologies in Learning*, 3(2). Available: http://online-journals.org/i-jet/article/view/220

Kay, R. (2007) A systematic evaluation of learning objects for secondary school students. *Journal of Educational Technology Systems*, 35(4), 411-448.

Kay, R. H. & Knaack, L. (2007) Evaluating the learning in learning objects. *Open Learning*, 22(1), 5–28.

Khaili, A. & Shashaani, L. (1994) The Effectiveness of Computer Applications: A Meta-Analysis. *Journal of Research on Computing in Education*, 27(1), 48-61.

Lambe, P. (2002) *The autism of knowledge management.* Available: http://www.straitsknowledge.com

Littleton, A. (2003) Issues in reusing online resources. In A. Littleton (Ed.) *Reusing online resources* (London, Kogan Page), 1-6.

McCormick, R. (2008) Evaluation of a Large-scale European Learning Object production, distribution and use. In L. Lockyer, S. Bennett, S. Agostinho & B. Harper (Eds.) *Handbook of Research on Learning Design and Learning Objects: Issues, Applications and Technologies* (Information Science Reference).

McCormick, R. & Li, N. (2006) An evaluation of European learning objects in use. *Learning, Media and Technology*, 31(3), 213–231.

McLuhan, M. & McLuhan, E. (1988) *Laws of media: The new science* (Toronto, University of Toronto Press).

Nurmi, S. & Jaakkola, T. (2005) Problems underlying the learning object approach. *International Journal of Instructional Technology & Distance Learning*, Nov. 2005, 2(11), 61-66. Available: http://www.itdl.org/Journal/Nov_05/

Nurmi, S. & Jaakkola, T. (2006) Promises and pitfalls of LOs. *Learning, Media and Technology*, 31(3), 269–285.

Parrish, P. E. (2004) The trouble with learning objects. *Educational Technology Research & Development*, 52(1), 49-67.

Parrish, P. E. (2008) Learning with objects. In S. Carliner & P. Shank (Eds.) *Handbook of E-Learning. Past Promises, Present Challenges* (San Francisco, CA, Pfeiffer), 215-240.

Rehak, D. (2006) Challenges for ubiquitous learning and learning technology. *Educational Technology*, January-February, 43–49.

Rehak, D. & Mason, R. (2003) Keeping the learning in learning objects, in: A. Littlejohn (Ed) *Reusing online resources: A sustainable approach to e-learning* (London, Routledge), 20-34.

Richards, G. (2002). Editorial: The challenges of the learning object paradigm. *Canadian Journal of Learning and Technology*, 28(3). Available: http://www.cjlt.ca/content/vol28.3/editorial.html

Rosenthal, R. (1984) *Meta-analytic procedures for social research. Applied Social Research Methods Series. Volume 6* (London, Sage).

Sclater, J., Sicoly, F., Abrami, P. C. & Wade, C. A. (2006) Ubiquitous technology integration in Canadian public schools: Year one study. *Canadian Journal of Learning and Technology*, 32(1) Winter. Available: http://www.cjlt.ca/content/vol32.1/sclater.html

Stipek, D. J. (1993) *Motivation to learn. From theory to practice.* Second edition (Needham Heights, MA, Allyn and Bacon).

Tompsett, C. (2005) Reconfigurability: Creating new courses from existing learning objects will always be difficult! *Journal of computer assisted learning*, 21(6), 440-448.

Triona, L. M. & Klahr, D. (2003) Point and click or grab and heft: Comparing the influence of physical and virtual instructional materials on elementary school students' ability to design experiments. *Cognition and Instruction*, 21(2), 149-173.

Wang, Y., Peng, H., Huang, R., Hou, Y. & Wang, J. (2008) Characteristics of distance learners: Research on relationship of learning motivation, learning strategy, self-efficacy, attribution and learning results. *Open Learning*, 23(1), 17-28.

Waxman, H. C., Lin, M. & Michko, G. M. (2003) A meta-analysis of the effects of teaching and learning with technology on students outcomes. Available: http://www.ncrel.org/tech/effects2/waxman.pdf

Weller, M. (2004) Learning objects and the e-learning cost dilemma. *Open Learning*, 19(3), 293-302.

Wilhelm, P. & Wilde, R. (2005) Developing a university course for online delivery based on learning objects: From ideals to compromises. *Open Learning*, 20(1), 65-81.

About the Authors

Sami Nurmi, M.Ed. was formerly a researcher at the Centre for Learning Research of the University of Turku, Finland. Currently Nurmi is studying to be an airline pilot and at the same time preparing his educational sciences PhD dissertation on learning with simulation learning objects. Correspondence should be sent via email tosami.nurmi@utu.fi

Tomi Jaakkola, M.Ed. is a researcher at the Centre for Learning Research of the University of Turku, Finland. Jaakkola is currently preparing his educational sciences PhD dissertation on the use of learning objects (LOs) and computer simulations to promote conceptual change and students' understanding of complex scientific concepts.
Email: tomi.jaakkola@utu.fi

Editor's Note: This study is of particular interest to those who teach using this technology. Certainly, the positive results are justified. However, more research is called for to establish the reality of this education format and eliminate any question of a "Hawthorne" effect.

Using Asynchronous Video in Online Classes: Results From a Pilot Study

Michael E. Griffiths and Charles R. Graham

USA

Abstract

The purpose of this study was to show how asynchronous video communications between instructors and students can capture verbal and non-verbal cues to establish a high level of Social Presence and Instructor Immediacy in an online setting. Fifty pre-service teachers at Brigham Young University took part in a new online section of the class entitled "Effective integration of technology in teaching" in which the instructional materials were mostly in the form of video clips recorded by the instructor, and in which students responded to assignments by recording their answers and responses in webcam video clips that were sent to the instructor. The instructor gave feedback to individual students in the form of recorded webcam video clips. Data for this study include instructor and student perceptions. Student data is in the form of student ratings scores and comments that are given anonymously as part of normal end of class procedures for all classes at BYU.

Keywords: Action research; asynchronous discussion; asynchronous video; webcam; online discussion; immediacy; social presence; teaching presence.

Introduction

The Effective Integration of Technology in Teaching (IP&T 287) is a class that is required for all elementary education students in teaching undergraduate programs at Brigham Young University (BYU). The purpose of the class is to teach students how to effectively implement technology into teaching and to give them exposure to several relevant educational technology tools that relate to early childhood and elementary-aged children. As this class has developed over the last several years, one particular challenge has consistently arisen; there is usually a wide range of technology skills amongst the students in the class and therefore it is difficult to know how to pace the instruction and project work. For some students the pace is too slow and they feel that their time is wasted, for others the pace is too fast and they feel like they have not had enough time to grasp the technologies. For Winter 2008 it was decided to teach the class in an online format to allow students more flexibility with the pace of the class.

The online section incorporated the use of asynchronous video messages (recorded with webcams) between students and the instructor for many of the class assignments. Students were offered the choice of taking the class either online or face-to-face. For the online class, instructional materials were recorded. Video clips of the instructor discussing and presenting topics and instructions for completing projects and assignments were either in the same video-clip format or in text format. Other materials included video clips narrated by the instructor demonstrating the various educational software tools that they were required to use. In addition, the instructor recorded additional video clips on a weekly basis that were sent to all students with messages of encouragement, reminders, and announcements. The class and, in particular, the asynchronous video format is the subject of this action research study. This paper describes the feedback from students collected as part of the standard student ratings system and also the observations and perceptions of the instructor.

Instructor Immediacy and Social Presence

Online courses have many benefits over face-to-face instruction that include increased access, improved quality of learning, better preparation of students for a knowledge-based society, and "lifelong" learning opportunity (Appana, 2008). Notwithstanding the ever increasing popularity of online courses, it is recognized that there are also limitations in their ability to replicate critical features of a normal classroom environment such as social interaction, prompt feedback, engaging activities, instructional flexibility, the dynamism of a knowledgeable scholar, and adaptation to individual needs (Larreamendy-Joems & Leinhart, 2006). It has been shown that certain elements of social interaction can be replicated in some degree through text based asynchronous learning environments (Rourke, Anderson, Garrison & Archer, 1999). However, the medium of text does not have the capacity to include the richness of all the senses implicit in face-to-face human interaction (Graham, 2006). Social interaction is one of the most obvious limitations of online learning. In an educational context, social interaction has multiple facets that include the individual student-instructor relationship and the overall learning community which includes the instructor and all students.

Close social interaction between teacher and student which is one important facet of the overall domain of social interaction is often discussed in terms of Instructor Immediacy. Immediacy is defined as those communications behaviors, some visual others vocal, that enhance closeness to and non-verbal interaction with another (Mehrabian, 1969). Rovai (2000) elaborates that Instructor Immediacy is the immediate verbal and non-verbal communications such: as smiles, head nods, use of inclusive language, and eye contact, which promote increased learning. Both Christophel (1990) and Christensen (1998) add the distinction that improved teacher immediacy impacts student motivation which in turn improves student learning. These studies suggest that immediacy has an indirect rather than a direct impact on student learning since it is, in reality, student motivation that directly impacts student learning. As the natural level of motivation is different in all students, it is reasonable to assume that Instructor Immediacy would most likely have the lowest level of impact on students with high natural levels of motivation. Frymier (1993) investigated the interaction of students' motivation to study and instructors' immediacy in a traditional face-to-face learning environment. Her research concluded that students who began a course with low to moderate motivation to study had increased motivation to study after interacting with a highly immediate instructor, while students with a high level of motivation were unaffected by the high level of immediacy. With the evidence suggesting that close social interaction, or immediacy, between an instructor and a student is correlated with student motivation especially for students who have a low to moderate natural level of motivation, there is an obvious need to investigate the Instructor Immediacy limitations that exist in online learning. Rovai (2002) states that the verbal and non-verbal communications included in Instructor Immediacy can be easily transmitted in the close physical proximity of the instructor and student in a face-to-face classroom setting.

Online learning environments do not have the advantages of the close proximity and all of the sensory perspectives and perceptions that are available in the face-to-face setting. Due to this dynamic it may be reasonable to assume that Instructor Immediacy is a less likely product of an online class. The Community of Inquiry Framework (Garrison & Archer, 2003) situates the principle of Instructor Immediacy mostly within the domain of Social Presence. In the Community of Inquiry Framework, Social Presence is described as, "The ability of participants to identify with the community (e.g., course of study), communicate purposefully in a trusting environment, and develop inter-personal relationships by way of projecting their individual personalities" (Arbaugh, Cleveland-Innes, Diaz, Garrison, Ice, Richardson, et al., 2007). Using Social Presence as an approach, the issue of verbal and non-verbal cues involved in projecting immediacy is discussed in terms of projecting individual personalities. Therefore in the

context of this theoretical approach, the establishing of Social Presence in an online setting is not easy due to the lack of verbal and non-verbal cues and the sensory perspectives and perceptions that exist in a close proximal setting.

The Challenges of Using Live Video

Some access to verbal and non-verbal communication can be available in an online setting through audiovisual technologies. Audiovisual technologies such as teleconferencing and webcams can be used synchronously and asynchronously. With the capacity to deliver verbal and non-verbal communication, audiovisual technology is a medium that can be used to facilitate the communication of Instructor Immediacy and establish Social Presence. Live video has become a popular medium in many online settings including education. However, there are substantial limitations that currently exist in using live video as a medium in online learning environments.

Live video conferences require a high level of coordination, and are subject to many technical problems that can cause the experience to be negative for students. There is an expectation of video conferences that they will replicate the essence of a close physical location experience, and while expensive videoconferencing equipment that is often used in commercial settings works well, the most available inexpensive technologies involving video through the internet are subject to bandwidth restrictions, and software/hardware issues. When these problems occur, a video conference can often be a disappointing experience. Also, video conferences take away one of the main benefits of online learning; learner time flexibility. Online students have the benefit of choosing the time and circumstances of their learning experience, and that benefit is removed when they are required to participate in live video conferences.

Asynchronous Video

The other type of audiovisual communication available to online learning environments is asynchronous video communication. Asynchronous video communications that are in the form of clips recorded by the students or by the instructor that are then sent to another party may provide a potential way of solving some of the Social Presence problems of online environments. In fact, even asynchronous audio communication alone has demonstrated the ability to convey some degree of Social Presence. Following their study on the use of asynchronous audio as a tool from instructors to communicate feedback to students, Ice, Curtis, Phillips and Wells (2007) state that audio feedback was associated with feelings of increased involvement and enhanced learning community interactions. Video clips add visual elements to the audio and thus add the possibility of communicating visual as well as verbal cues to asynchronous communications.

Self recorded video clips contain many of the verbal and non-verbal cues that exist in a face-to-face environment. These asynchronous forms of video communications, although not as rich as a live experience in totality, are not bound by the same network and software problems as live video conferences, and the expectations of the experience are completely different. An asynchronous video communication can always be re-recorded before being sent or replayed many times whereas if a problem occurs in a live video conference, the time and content relating to the length of the problem are most likely lost. The affordance of asynchronous video communication is an area for exploration as to how it could help to establish a high level of Social Presence and immediacy in online educational settings.

Purpose of this Study

The overall purpose of this study was to observe the impact of personalized asynchronous video communication between instructor and students on the motivational level of the students. As motivational levels of students has been shown to be affected by Social Presence and immediacy, the specific question addressed in the study is whether personalized asynchronous video

communications from instructors to students can capture a sufficient level of verbal and non-verbal cues to establish a high level of Social Presence and immediacy.

Research Methodology

The use of asynchronous video for instructor presentation, student assignment, and instructor feedback is an innovative intervention that was used for the first time at BYU in the online section of IP&T287 in the Winter semester of 2008. The method for studying the results of this intervention is predominately based on two of the Sloan Pillars, which are Student Satisfaction and Teacher Satisfaction. The analysis of Student Satisfaction is based upon data from the BYU Student Ratings system which for the purpose of this study consists of 16 Likert scale questions, and one open ended question. Of the 16 Likert scale questions seven are focused on student perceptions of the course, eight are focused on student perceptions of the instructor, and one is focused on student perceptions of the overall quality of the course and the instructor. The open ended comments are studied using a thematic analysis where elements of comments are categorized by a positive or negative statement regarding the effectiveness of the course, the attitude of the instructor, the online nature of the course, and the asynchronous video communications. The analysis of Teacher Satisfaction is based upon field note entries made by the instructor throughout the semester as well as instructor reflections and observations that were made after the end of the class.

Pilot Study: Asynchronous Video in an Online Course

Structure of the Course

The only time that the whole class met together was the first day of class where the instructor briefly explained the online class structure. The students were then required to go to the class website using the internet and to follow the instructions on the site. The first thing that students were required to do was to watch a video clip in which the instructor introduced themselves and then explained the goals and objectives of the class.

One assignment in the first section of the class required students to record a webcam clip to send to the instructor. In this clip, students were required to introduce themselves, describe something unique about themselves, and to respond to a discussion question. Video clips were sent to the instructor as email attachments. On the class website, there were instructions in the form of video clips showing how to use Windows Movie Maker to record video clips in the correct format. On reception of each video clip sent by students, the instructor recorded a video clip of themselves in which the instructor responded to the personal introduction given by the student, expressed encouragement, and stressed that the instructor would do their best to help when needed, and finally gave some feedback on the student's response to the discussion question.

Students sometimes watched video clips of the instructor presenting topics reinforced with diagrams and pictures. Most of the assignments involved using software programs such as Photostory, Google Earth, Movie Maker and suchlike to produce projects that could be used in a K-12 setting. The class website included textual instructions on the requirements of assignments and, in most cases, screen capture video clips showing how to use the software applications. Several assignments required the students to record a video clip of themselves explaining the rationale for their projects or responding to a discussion question. From time to time the instructor sent emails with encouragement and reminders, and several times the instructor sent these messages in the form of recorded video clips instead of textual messages. The final class assignment required each student to send a video clip to the instructor answering several final exam questions and also giving general feedback on the class.

Student Ratings Data

All students at BYU are invited and encouraged to submit ratings for each class that they attend. The ratings are anonymous and instructors can only view the ratings after student grades are submitted. This paper examines 10 Likert scale questions from the BYU student ratings system. Each question has eight possible responses that generate a score of one to eight. In all cases the lowest response equates to a score of one and the highest score equates to a score of eight. Therefore if a course receives an overall score of eight for one of the questions that means every student that rated the course gave it the highest score for that item. For each of the 10 Likert scale questions discussed in this study, the score for the online section of IP&T287 that is the object of this study, with all other sections of IP&T287 in Winter 2008 (N=4), and all courses in the School of Education at BYU in Winter 2008 (N=385), and finally with all courses at BYU in Winter 2008 (7065). For the online section of IP&T287, 38 of 50 (76%) of students completed the student ratings.

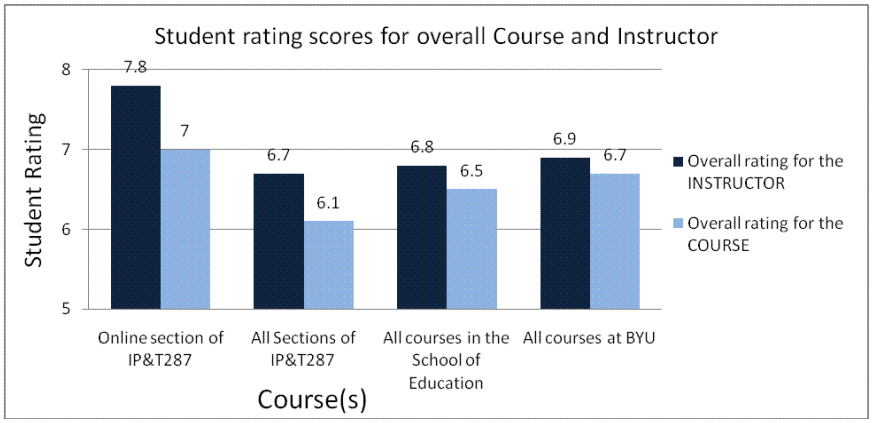


Figure 1: Student rating scores for overall Course and Instructor

Figures one to five compare the student ratings of the online course with average from all four sections of IP&T287 taught in Winter 2008, and with the overall ratings for all course in the school of Education, and with the overall ratings for all courses at BYU. All sections of IP&T287 had a similar number of students, and three of the sections were traditional face-to-face classes with the online section being the fourth. Figure 1 shows the results of the two ratings items that measure overall student perceptions of the instructor and the course. For these two rating items, students can select from the following scale: Very Poor, Poor, Somewhat Poor, Fair, Good, Very Good, Excellent, and Exceptional. Very Poor is a score of one and Exceptional is a score of eight.

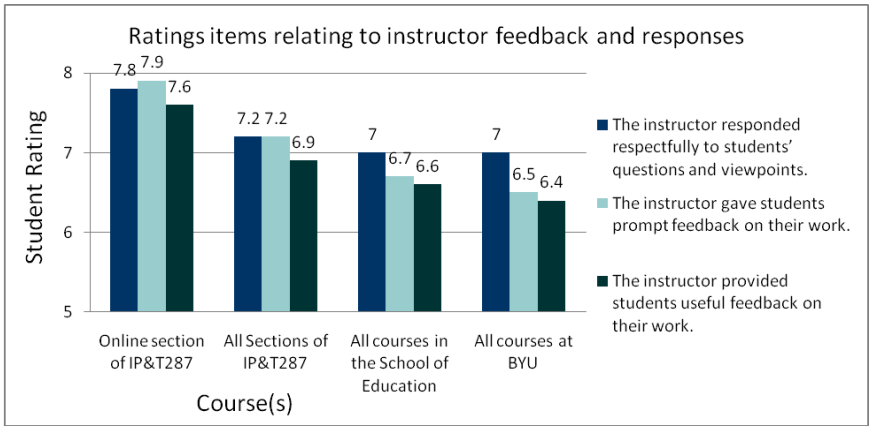


Figure 2: Ratings items relating to instructor feedback and responses.

Figure 2 shows the results for three student ratings questions that relate to instructor feedback and instructor responses. Figures 2 – 5 shows the student ratings results for the other eight student ratings questions that are included in this analysis. For each of these eight questions, students can select from the following scale: Very Strongly Disagree, Strongly Disagree, Disagree, Somewhat Disagree, Somewhat Agree, Agree, Strongly Agree, and Very Strongly Agree. Very Strongly Disagree is a score of one, and Very Strongly Agree is a score of eight.

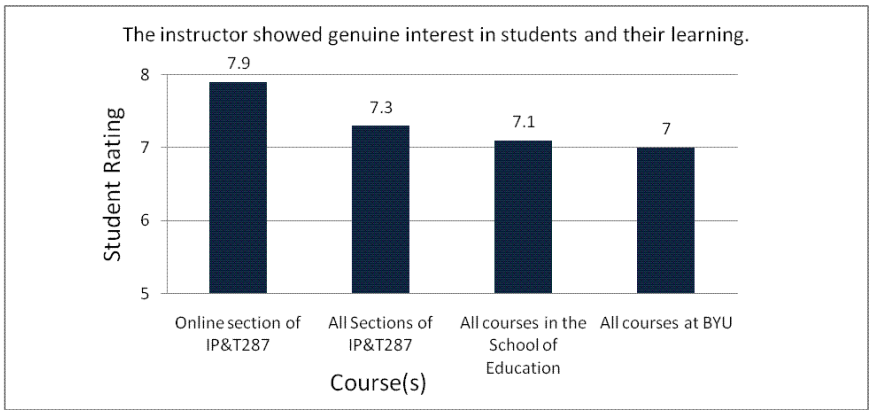


Figure 3: Ratings: The instructor showed genuine interest in students and their learning.

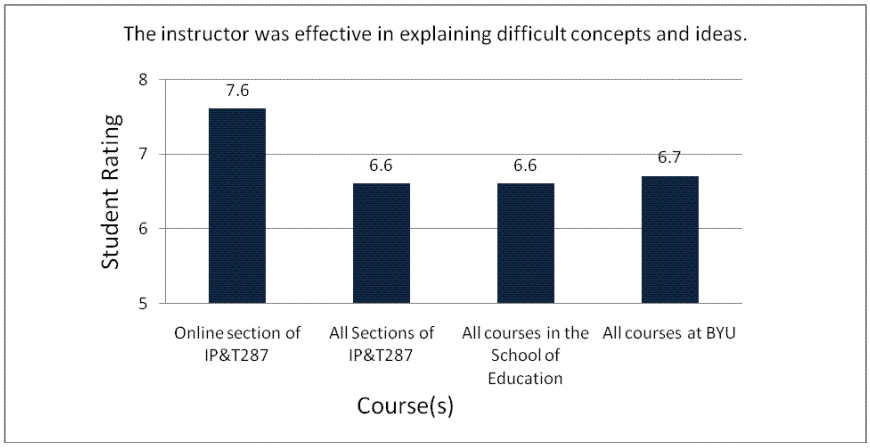


Figure 4: Ratings: The instructor was effective in explaining difficult concepts and ideas.

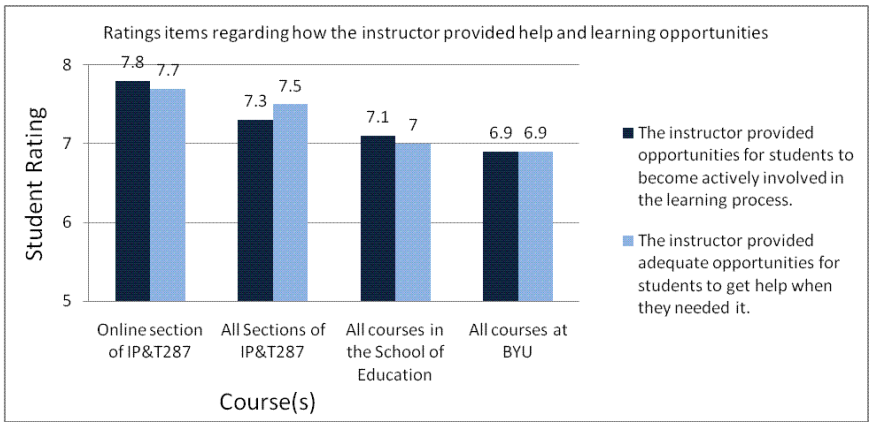


Figure 5: Ratings: how well the instructor provided help and learning opportunities.

Figure 3 shows the results of a ratings item that shows students perception of how genuinely interested they felt the instructor was in their learning and in them personally. Figure 4 shows the results of a rating item that shows students perceptions of how effective the instructor was in explaining concepts. Figure 5 shows the results of two rating items that show student perceptions of how well the instructor provided help and active involvement in the learning process.

Student Ratings Comments

At the end of the student ratings online form for each course, students are invited to add open-ended comments with the following instructions: "Please add any comments or suggestions you have about your learning experience in this course with this instructor." For the online section of IP&Y287, 28 of the 38 students that completed the student ratings chose to leave comments. A thematic analysis of these comments resulted in finding 133 distinct statements that were made. The 133 distinct statements were categorized by the 14 themes shown in Table 1, and each distinct statement was also defined as being either a positive statement, a negative statement, or a statement that simply described some kind of difficulty experienced in the class. Statements that are negative or reporting a difficulty are shown in italics. Table 1 shows that 127 out of 133 statements were positive about some aspect of the instructor or of the course and only two statements were considered to be negative.

Instructor Perceptions

The field notes that were recorded by the instructor at regular intervals in the Winter 2008 semester provide the basis for an analysis of instructor perceptions of the course. The instructor reported that although there was a fair amount of extra work involved in the initial design and set up of the online class, the actual running of the class was no more difficult or burdensome than the face-to-face version. In terms of overall time commitment, the instructor stated that the online version of the class actually took less of his time, and that it changed the way he worked. He would read emails, watch video clips, and respond to individual students at various times of the day including evenings and weekends whenever he happened to be online. This is in comparison to the face-to-face class where he would store up assignments to grade at regular intervals. The instructor declared that this actually reduced stress as a large pile of work rarely accumulated. However, the instructor recognized that this pattern of flexibility suited him personally, but might not suit other instructors.

The instructor stated that the video clip presentations by students were a better representation of their actual level of knowledge than the written assignments that are required in the face-to-face class. The instructor also reported that the responses contained more information, and that he was able to more accurately discern the knowledge and skills of the students due to the audio-visual cues inherent in a video clip presentation. The instructor also stated that they knew more about each individual student than he felt was possible in the face-to-face class setting, which meant that he was consequently more able to respond to the individual needs of each student. The instructor stated that he did not think that there were many benefits of the face-to-face class that were lacking in the online class with the exception of the dynamic nature of class brainstorming that he stated was a helpful part of the learning process for the face-to-face students.

Table 1

Thematic Analysis of Student Comments from the Student Ratings System

Theme of statement	Positive	Negative	Difficulty	Example
Perception of instructor in general	18			The instructor was personable with the students even though this was an online section.
Perception of instructor care/concern	18			The instructor really showed that he cared about us as students.
Perception of course in general	17			Overall, this class was a really good experience.
Perception of the online method	17			I loved doing this class online and being able to work at my own pace.
Perception of help/responsiveness of instructor	15			The instructor with this course was extremely helpful.
Perception of activities/materials	8		1	I felt like the assignments we did were directly applicable to my teaching. *Some of them took a very long time to complete.*
Perception of instructor as inspiring or motivational	9			The instructor encouraged us in our assignments.
Perception of learning experience	8			I learned a lot of valuable information in this course.
Perception of the organization of the course	6	1		Course was very well organized. *Obviously this was the first time this class has been online, so hopefully next semester it will be a little more organized.*
Perception of communication in the course	5			Instructor was very good at communication between teacher and students - especially for an online class.
Perception of the use of webcam video clips	5			It was much more personal this way, even more so than a face-to-face class usually is.
Perception of technical Issues			3	*The main reason this class is hard to take online is because if the many technical difficulties I and others experienced.*
Perception of feedback/grades		1		*The only problem is we received feedback not necessarily any grades.*
Perception of one-on-one time with instructor	1			Even though this was an online course and I did not see the instructor as much as my other professors, he provided me more help and one on one time than any other professor.

Results and Discussion

The overall perception of the instructor of the online class is that the asynchronous video communications method did seem to allow for the establishing of Social Presence and Instructor Immediacy, and in addition, the asynchronous video communications method resulted in some other surprising benefits that at a first glance appear to positively impact the overall quality of student learning. The student ratings scores for the online section of the class show if nothing else that the student perception of the class is very positive in comparison with other classes. For every single student ratings item, the online section of IP&T287 is rated higher than the average score of all sections of IP&T287, higher than the average score of all courses in the School of Education, and higher than the average of all courses at BYU. There may be many reasons why this would be the case that are not connected to the use of asynchronous video, and the only sure statement that can be made regarding the student ratings scores is that the students had a very favorable perception of the online class when compared with other courses.

The voluntary comments made by students as part of the student ratings process reveal more detail about student perceptions. The distinct statements that were analyzed in this study reveal clearly articulated and highly positive student perceptions. Student statements suggest that Instructor Immediacy and the Social Presence of the instructor were achieved and that students even felt that certain aspects of the class were superior to their experience of face-to-face classes. One student stated that the experience was more personal than a face-to-face class, and another student stated that felt that they had more one-one-one time with the instructor than in face-to-face classes.

In addition, the instructor states that the student responses in the format of recorded video clips gave the instructor a much better level of understanding of the depth of knowledge of the students than can normally be ascertained through written responses. It would perhaps be possible to obtain this same result in a face-to-face class by having an oral interview with each student for each assignment, but the time and organization that would be required to achieve this is simply impractical. It may also be the case the students can respond more freely and naturally to assignments on a webcam than they could if they were in the physical presence of the instructor. With that being the case, it appears that using asynchronous video combines the benefits of face-to-face personalized communication and evaluation with the efficiency and flexibility of asynchronous online education.

Another benefit that has emerged as a result of using the asynchronous video communications is that the instructor-student relationship seems to have been stronger. In effect, students reported feeling more individual contact and a more personal relationship, and the instructor reported that they felt that they knew more about individual students, their individual situations and learning needs than would normally be possible. As an example, the first webcam message that students were required to send required an introduction including something unique about themselves. The instructor was able to observe this introduction, listening to the words while observing the face and body language of the student giving a vivid personal introduction. Also, students were able to express some unique and interesting things about themselves that helped the instructor know them better as individuals. Although this can be achieved in a face-to-face class, it is rare for every student in a class of 50 to give a 3 minute introduction of themselves as it takes so much class time.

The instructor was able to personalize a video reply to each of the student introductions which began the process of an individual dialog between the instructor and each student. This pattern created in some degree an individualized class experience for each student. No student was able to hide in a corner in class as timid students can sometimes do, and no student was able to dominate the discussion as some students can sometimes do. These are some of the regular benefits of online education, but the asynchronous video brought in an aspect of face-to-face

education that is normally lacking in an online setting. Every student communicated in video format several times with the instructor, and every student received an equal amount of attention in video format from the instructor. The perception of the instructor is that seeing a student present themselves in a video, and having students see the instructor give feedback and encouragement in a video, creates a real and personal connection that rivals, and in some ways exceeds the level of personal connection that can be achieved in a face-to-face class.

The students' comments also revealed that they enjoyed the online nature of the class and how it gave them flexibility and the ability to work at their own pace. This factor alone may well positively impact all other factors in the minds of students. However it is difficult to ignore the overwhelmingly positive student ratings scores and student comments relating to all aspects of the class. Placing this study in context, the instructor also taught a face-to-face section of IP&T287 in Fall 2007. That class followed a very similar syllabus to the online class and was in the format of one two hour class session per week. The instructor and the course received higher than average student ratings scores, but not as high as was received for the online section, and additionally, many students' comments contained negative statements. Out of 105 distinct statements made by students in the face-to-face section, 23 (22%) were negative. In the online section that is the subject of this study, only two of 133 statements were considered to be negative. Although the exact reasons are difficult to confirm conclusively, it is clear that the online section was positively perceived by students, and it was clearly more universally appreciated by students than the most comparable face-to-face version of the class.

Conclusions

The online section of IP&T287 was a pilot study of both the suitability of teaching IP&T287 in an online setting and of the potential of asynchronous video as a class communications method. For this initial pilot study and the time constraints involved it was not possible to design and implement a more robust study methodology. However, the online class and especially the asynchronous video communications were so well received by students, and many aspects of the class success were surprising and exciting to the degree that a need was felt to publish the results of the pilot study. In addition, the results of this pilot have caused several other instructors in the School of Education to use the asynchronous video method to varying degrees. A larger scale study involving all of these sections will be carried out and will incorporate the measurement instrument for the Community of Inquiry Framework. It is also recommended that the asynchronous video communications method be tested and studied in variety of other institutions in order to provide different perspectives.

Asynchronous video communication may well be a technological method that can bridge the gap between the worlds of online and face-to-face education, and gain the best from both worlds. Face-to-face education has the highest level of affordance for Social Presence and Instructor Immediacy, and online education has the highest level of affordance for flexibility in time and geographical distance and for personalized instruction. Asynchronous video appears to have a high affordance for Social Presence and Instructor Immediacy and, in addition, has the capacity to bring the richness of face-to-face communication to the personalized instruction of online education. Finally, unlike live streaming video, asynchronous video retains the time flexibility benefits of online education. Is it possible that such a simple approach as asynchronous video using webcams could actually be a way to gain the best of both educational worlds? Perhaps so, and it is recommended that development continue in the use of asynchronous video via webcam as an educational communications method.

References

Appana, S. (2008). A Review of Benefits and Limitations of Online Learning in the Context of the Student, the Instructor, and the Tenured Faculty. *International Journal on E-Learning*, 7(1) 5-22.

Arbaugh, J. B., Cleveland-Innes, M., Diaz, S., Garrison, D. R., Ice, P., Richardson, J., et al. (2007). Community of Inquiry Framework: Validation & Instrument Development. *13th Annual Sloan-C Conference.* Orlando, FL.

Garrison, D. R. (2003). A theory of critical inquiry. In M. G. Moore & W. G. Anderson (Eds.), Handbook of distance education (pp. 115). Mahwah, NJ: Lawrence Erlbaum Associates.

Graham, C. R. (2006). Blended learning systems: Definition, current trends, and future directions. In C. J. Bonk & C. R. Graham (Eds.), Handbook of blended learning: Global perspectives, local designs (pp. 3-21). San Francisco, CA: Pfeiffer Publishing.

Christophel, D. (1990). The Relationships among Teacher Immediacy Behaviors, Student Motivation, and Learning. *Communication Education*, 39 (4), 323-40.

Christensen, L., & Menzel, K. (1998). The Linear Relationship between Student Reports of Teacher Immediacy Behaviors and Perceptions of State Motivation, and of Cognitive, Affective, and Behavioral Learning. *Communication Education*, 47(1), 82-90.

Frymier, A. (1993). The impact of teacher immediacy on students' motivation over the course of a semester. Paper presented at the Annual Meeting of the Speech Communication Association, Miami Beach, FL

Ice, P., & Curtis, R., & Phillips, P., & Wells, J. (2007). Using Synchronous Audio Feedback to Enhance Teaching Presence and Students' Sense of Community. *Journal of Asynchronous Learning Networks*, 11(2).

Larreamendy-Joems, J., & Leinhart, G. (2006). Going the Distance With Online Education. *Review of Educational Research*, 76(4), 567-605.

Mehrabian, A. (1969). Some Referents and Measures of Non-verbal Behavior. *Behavioral Research Methods and Instruments*, 1, 213-217.

Rourke, L. & Anderson, T. & Garrison, R. & Archer, W. (1999). Assessing *Social Presence* In Asynchronous Text-based Computer Conferencing. *The Journal of Distance Education*, 14(2).

Rovai, A. (2000). Building and sustaining community in asynchronous learning networks, *The Internet and Higher Education*, 3(4), 285-297.

Rovai, A. (2002). Building Sense of Community at a Distance. *Review of Research in Open and Distance Learning*, 3(1).

About the Authors

Michael Griffiths is a Senior Project Manager in the Center for Teaching and Learning at Brigham Young University (BYU). Michael received an MS from the department of Instructional Psychology and Technology at BYU where he is also in the process of completing a PhD. Michael spent 16 years in the field of Information Technology including running a software business before changing paths to begin a career in the field of education. Michael has also been a Trustee and CFO of two new charter schools in Utah. Michael is particularly interested in studying and innovating online learning environments.

EMAIL: mike_griffiths@byu.edu

Charles R. Graham is an Associate Professor of Instructional Psychology and Technology at Brigham Young University with a focus on technology-mediated teaching and learning. Charles is particularly interested in studying the design and evaluation of blended learning environments.

EMAIL: Charles_graham@byu.edu