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Authors
**Foreword**

Dr. Narimane Hadj-Hamou

Assistant Vice-President for Academic Affairs
Chair, e-Learning Excellence in the Middle East Forum 2

It gives me immense pleasure to introduce in the e-Learning Excellence Forum 2 proceedings a body of research work on various aspects of e-learning. The global evolutions of e-learning described and analyzed in some very interesting research papers collected in this volume of course have great impact at the regional level as well. The Middle-East and North Africa (MENA) region has been witnessing a rising tide of interest in e-learning. Therefore, the findings of research papers presented here would of course be of great interest to policymakers, academics, practitioners, media organizations and all those interested in e-learning.

Policymakers in the MENA countries have come to realize the significance of e-learning in the context of the education and training sectors. In view of the waves of socio-economic development in a large number of MENA countries, e-learning has come into sharper focus. In this evolution, two main phenomena are examined with emphasis by the authors of papers presented here—the growing use of information and communications technologies (ICTs) and the integration of these ICTs in the strategies of e-learning institutions. Some of the papers collected in this document cover examples of applications of ICTs in a cross-section of countries. Knowledge management, attitudes towards e-learning and the rapid proliferation of technology to facilitate e-learning are also comprehensively covered. In developing countries, the use of ICTs has assumed a pattern similar to what one finds in some developed countries. It seems to suggest that the e-learning sector is getting internationalized. However, e-learning in cross-cultural contexts requires operationalization at the micro level.

I sincerely hope, you will enjoy reading the research papers presented herein. I also hope that these papers will generate very healthy and fruitful discussions at the forum sessions.

We stand committed to the task of generating useful ideas through the medium of the forum. These ideas, I trust, are going to help build a formidable body of knowledge related to the theme of the forum.

Finally, I would like to express my sincere appreciation to the members of the Technical Committee for their efforts in meticulously reviewing the papers that have come from various parts of the world.
Attitudes towards e-Learning: Exploratory Evidence from UAE

Flavy Lasrado
eTQM College, Dubai, UAE

Abstract
A review of literature explicitly suggests that while various aspects of e-learning have been a subject of intense discussion in contemporary literature (David and Johannsen 2001; Keller and Cernerud 2002; Newton 2003), the attitudes towards e-learning in a blended learning environment (particularly in the context of the UAE) have not been subjected to a meaningful analysis. This study makes a modest attempt to fill this gap in the existing literature with a help of some empirical evidence.

Keywords: e-Learning, Cross-Cultural Context, Attitude, UAE

Introduction
The Gulf Co-operation Council Countries (GCC) countries have taken steps to develop knowledge-based economies. The decision makers in these countries realize that in order to compete successfully in the context of globalization, they must concentrate on the question of spreading education far and wide. Surely, the role of e-learning is critical in their quest to bring about a knowledge-based transformation of their economies. While e-learning in the context of distance education has generated thought-provoking discussion in literature (Hara and Kling1999), the situation prevailing in the UAE, particularly with reference to a blended learning framework, has not been adequately studied and analyzed. This study makes a modest attempt to fill this gap in the existing literature by studying the perceptions of students towards e-learning in a blended learning environment. The study is organized as follows.

Section 2 reviews relevant literature. Section 3 explains the research design. The penultimate section presents empirical evidence. The final section makes some concluding observations and highlights the limitations of the study.

A Retrospection of Literature
With growing sophistication of job markets in GCC countries, it has become quite inevitable and of course challenging for learners drawn from diverse cultural backgrounds to improve their knowledge and skills. E-learning is certainly a promising option for in-career personnel.

A review of available literature suggests that e-learning is a case of active restructuring on the part of the learner. Restructuring actually takes place through engagement in the process of problem posing and problem solving, inference drawing and resolving issues by applying rational thinking. These all processes call for more active learners and a different format of education. E-learning helps students feel empowered to think and learn for them (Johnson et al 1991).

A comparison of traditional and e-learning frameworks is presented in Table 1.
Surely, the Internet has paved the way for new opportunities for educational institutions. They seem to be designing e-learning strategies that go beyond the issue of connectivity and address the needs of the learners in a dynamic way (Keller and Cernerud 2002).

Traditionally, academics in the area of education have tried to assess learning outcomes as academic achievement. Such measure, while quite invaluable, cannot of course give a complete picture of the receivers of education and training. Attitudes of students should also be studied. Undoubtedly, students are significant stakeholders in education. They can of course provide important insights into the attitudinal aspects of their learning experience, which may prove to be quite valuable for designing strategies to improve teaching and performance.

Literature suggests that attitudes towards e-learning may not be congruent due to cultural factors, particularly in the UAE where cultural diversity exists in a cross-section of organizations (Al-Abed and Hellyer, 2001). Attitudes are of course influenced by culture. National culture for the purpose of this paper is defined as “the collective programming of mind which distinguishes one national group or category of people from another, (thus) the interactive aggregate of common characteristics that influences a human group's response to its environment” (Hofstede, 1980). Culture is not directly observable, but can be analyzed from observed behaviors and statements. National culture implies that shared values distinguish the behavioral patterns of one individual from another. Therefore, it would be interesting to find out the attitudes of learners towards e-learning in a cross-cultural context of the UAE.

**Research Design**

Based on a review of literature focusing on e-learning and culture in various parts of the world including the Arabian Gulf region, a list of questions that appeared to influence e-learning attitudes was developed. During an initial phase of the study, five senior scholars of e-learning and two practitioners were invited to form a focus group. The guidelines developed by Morgan (1988) were used during the process of the focus group discussion. Several rounds of focus group discussion took place at e-TQM College and the outcomes were used to refine the survey instrument design.

**Survey Instrument**

During the second phase of the research exercise, a survey instrument was developed to capture e-learning attitudes in a cross-cultural environment. The focus group acted as a basis for the development of the questionnaire. The survey instrument has 2

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**Table #1. A Comparison of Traditional and e-Learning Frameworks**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Traditional Framework</th>
<th>E-learning Framework</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge</td>
<td>Transferred from faculty to students</td>
<td>Jointly constructed by learners and faculty</td>
</tr>
<tr>
<td>Learners</td>
<td>Passive receivers and consumers of ideas and knowledge</td>
<td>Active constructors of ideas and knowledge</td>
</tr>
<tr>
<td>Faculty Role</td>
<td>Teach students</td>
<td>Facilitate learning process</td>
</tr>
<tr>
<td>Relationships</td>
<td>Impersonal relationships between students and faculty</td>
<td>Personal interactions in a virtual learning environment</td>
</tr>
<tr>
<td>Environment</td>
<td>Competitive and individualistic learning activities</td>
<td>Virtual learning environment</td>
</tr>
<tr>
<td>Assumptions</td>
<td>Any expert can teach</td>
<td>E-learning is complex and requires qualified and trained faculty</td>
</tr>
</tbody>
</table>

(10 )
parts. The first part (including questions related to attitudes and cultural traits) sought to elicit information from the respondents on each of the questions identified. A 5-point Likert scale, with 1 representing “Strongly Disagree”, and 5 “Strongly Agree” was used to measure the responses. The second part of the questionnaire sought information for classification purpose.

**Sample Selection and Administration of Survey**

The target population for the study included all learners who participated directly or indirectly in the process of acquiring knowledge and skills. To ensure a fairly representative sample, respondents were selected from the record prepared by the Registrar of an institution of higher learning selected for this case study.

**Empirical Evidence**

This section presents empirical evidence gathered through the administration of the survey instrument. 100 questionnaires were personally given by this researcher to students participating in academic programs based on e-learning. 76 valid questionnaires were returned to the author. It is an impressive response rate in social science research. The following tables and graphs present the results of the empirical exercise.

<table>
<thead>
<tr>
<th>Sr #</th>
<th>Questions(Variables)</th>
<th>Mean (n=76)</th>
<th>Mode (n=76)</th>
<th>STDdev (n=76)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>I am open to ideas</td>
<td>4.25</td>
<td>5</td>
<td>0.939858145</td>
</tr>
<tr>
<td>2</td>
<td>It is important to express my views</td>
<td>4.16</td>
<td>4</td>
<td>0.87053882</td>
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<tr>
<td>3</td>
<td>I am an independent-minded person</td>
<td>3.91780822</td>
<td>4</td>
<td>1.03753748</td>
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<tr>
<td>4</td>
<td>I respect social hierarchy</td>
<td>4.01351351</td>
<td>4</td>
<td>0.986112379</td>
</tr>
<tr>
<td>5</td>
<td>It is important for me to be well-respected in the community</td>
<td>4.48684211</td>
<td>5</td>
<td>0.972877807</td>
</tr>
<tr>
<td>6</td>
<td>My lifestyle is influenced by society</td>
<td>3.57333333</td>
<td>4</td>
<td>1.002339605</td>
</tr>
<tr>
<td>7</td>
<td>I like my culture</td>
<td>4.02631579</td>
<td>4</td>
<td>0.965728522</td>
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<tr>
<td>8</td>
<td>Education is the most important key to success</td>
<td>4.32894737</td>
<td>5</td>
<td>1.100159478</td>
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<td>9</td>
<td>I respect e-learning</td>
<td>3.98684211</td>
<td>4</td>
<td>0.986487656</td>
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<tr>
<td>10</td>
<td>E-learning is respected</td>
<td>3.52631579</td>
<td>4</td>
<td>1.038892798</td>
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<tr>
<td>11</td>
<td>E-learning is associated with informalities in our culture</td>
<td>3.52631579</td>
<td>4</td>
<td>0.899415015</td>
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<tr>
<td>12</td>
<td>E-learning is as effective as traditional form of education</td>
<td>3.47368421</td>
<td>4</td>
<td>0.899415015</td>
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<tr>
<td>13</td>
<td>E-learning cannot provide hands-on practical experience</td>
<td>3.17333333</td>
<td>3</td>
<td>1.089020162</td>
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<tr>
<td>14</td>
<td>E-learning promotes self-discipline</td>
<td>3.53947368</td>
<td>4</td>
<td>1.19377038</td>
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<tr>
<td>15</td>
<td>E-learning symbolizes excellence</td>
<td>3.69736842</td>
<td>4</td>
<td>1.107787427</td>
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<tr>
<td>16</td>
<td>E-learning is part of a lifestyle</td>
<td>3.81578947</td>
<td>4</td>
<td>1.104059495</td>
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<td>E-learning creates harmony with policy tracks designed by the Government</td>
<td>3.71232877</td>
<td>4</td>
<td>0.904916387</td>
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Table #2. Attitudes Towards E-learning
Table #3. Demographic Information

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<th>Iraqi</th>
<th>Pakistani</th>
<th>Jordanian</th>
<th>Syrian</th>
<th>Algerian</th>
<th>Bangladeshi</th>
<th>Iranian</th>
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<th>English</th>
<th>Non-arabic</th>
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<th>Sex</th>
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<th>Female</th>
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<th>non islam</th>
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<th>UAE</th>
<th>UK/US</th>
<th>India</th>
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<th>20-30</th>
<th>31-40</th>
<th>more than 40</th>
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Table 2 provides an overview of the mean scores and standard deviations for the 17 questions. The mean score of the variable (openness to ideas) is 4.25, indicating that there is a strong degree of agreement by respondents on its importance in attitudes. Further, the small standard deviation scores suggest that there is a greater degree of consistency in the responses. Overall, the mean scores of other variables are greater than 3 indicating that each of the statements is agreed to by the respondents. Contrary to widespread perception, it emerged that e-learning is generally respected by the respondents. E-learning also emerged as part of the lifestyle, thus indicating positive attitudes of learners towards it.

It is also remarkable that the respondents generally agreed with the statement that e-learning is in line with the policy tracks designed by the government for socio-economic development.

During the qualitative interviews, some learners explicitly mentioned that the blended model of learning is ideal for undergraduate students. However, its limitation is for those who cannot make to the physical sessions because they live in geographically dispersed areas.

At the second level of analysis, Simple Logistic Regression (SLR) technique was used to investigate whether or not any relationships existed between variables and the new paradigm of education emerging in the GCC countries. The SLR is relatively free of restrictions with the capacity to analyze a mix of all types of predictors (continuous, discrete, and dichotomous). SLR which uses the pooled estimate of the standard error is equivalent to Pearson’s Chi-square test. The outcomes of the SLR test suggested that a significant positive relationship was found between the government policy tracks and the new paradigm of education ($\beta = 0.101; p<0.001$); respect for e-learning and the new paradigm of education ($\beta = 0.103; p<0.001$), and between self-discipline and the new paradigm ($\beta = -1.345; p<0.001$). Two other relatively important associations identified in the analysis are e-learning symbolizing excellence and the new paradigm ($\beta = -2.188; p<0.05$); and informality of e-learning and the new paradigm ($\beta = 0.167; p<0.01$).

A common thread running through the analysis is that there is no compelling evidence of negative attitudes towards e-learning. However, the respondents also agreed generally with the statement that e-learning cannot provide hands-on practical experience.

The demographic information related to the respondents clearly suggests that cultural variations have not affected in any significant way the attitudes towards e-learning.
Conclusion

A practical application of the study is that it can be used to suit policies and strategies of institutions of higher learning in the UAE. However, the overall institutional guidelines need to be “culturized” to attain the best possible fit between the needs of the learners and the needs of the institution. Possessing the knowledge of cultural factors that motivate or de-motivate learners in the direction of e-learning would surely be of interest to decision makers.

A review of literature and evidence available on the Web suggest that distance-learning programs are currently organized successfully by institutions of higher learning such as Duke University, Colorado State University, University of Baltimore, New York University, the University of Florida, the University of Maryland, the Massachusetts Institute of Technology, Ohio University, Penn State University, Stanford university, the University of Wisconsin, and the University of Tennesse(Online Universities 1999). Other institutions offering e-learning programs in a blended format include Capella University, Nova Southeastern University, and the University of Phoenix. The Commonwealth of Learning, Canada has also supported programs organized by open universities in India, Pakistan, Kuwait and Bangladesh. Recently, several consortia have been developed involving University of Texas System’s Telecampus, R. Ledu, the Electronic Campus, and the Western Governor’s University to offer online programs of study.

E-learning has been gaining popularity in various parts of the world, including the UAE. E-TQM College, for instance, has been a pioneer of e-learning programs in the Middle East. As e-learning formats start producing positive results in line with the policy tracks, attitudes are likely turn very positive in the Middle East.

Admittedly, this study is exploratory. It has produced rather patchy and incomplete evidence. Nevertheless, it has paved the way for pursuing further research focusing on various aspects of e-learning in a cross-cultural environment. Further study will be required to determine what would happen pedagogically if students turn to e-learning in great number.
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Adoption of Information and Communications Technology in the Education Sector: A Change Management Perspective

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Abstract
As a result of emerging and aspiring knowledge-based economies, e-Learning is a paradigm shift affecting most, if not all higher educational institutions, especially visible in the context of the United Arab Emirates. The increasing presence of Information and Communications Technology (ICT) in educational environments is pressing accelerated changes in the teaching and learning cycle, invoking the need for revised adoption and adaptation approaches. In terms of institutional management this also implies building faculty and staff readiness in addition to alterations to the educational system. This paper provides insight to the cause and consequences of changes related to the inculcation of ICT enabled education and provides a review of existing research in the relevant area of change management.

Introduction
International Labor organization (ILO) in 2002 appreciated the political leadership for creating and promoting initiatives towards building knowledge based economy and the fast-growing Information Communications Technology (ICT) sector in the UAE. Knowledge-based activities emerge when people, supported by ICT, interact in concerted efforts to co-produce (i.e. create and exchange) new knowledge. Knowledge has been at the heart of economic growth and is not a newly discovered factor to development. The thirst for knowledge has been a driver for progression from the beginning of civilization. "Knowledge-based economy”, however, is a recently coined term. As such, its true use is meant to signify a change from the economies of earlier periods, more of a sea-change than a sharp discontinuity (David and Foray 2002). The recognition of the role of knowledge in development has been learning behind the naming of the Knowledge-based economy. The information age has become an outdated term with the dawn of the Knowledge Era. The role of the political leadership has been very strong in promoting the economic and social progress of the UAE as a whole. The emirate of Dubai has accelerated initiatives in line with the national goal. According to Dr. Khalifa Mohammed Ahmed, Chairman, Dubai Ruler's Court (AMEInfo 2003 Press release), “In a drive to make Dubai a knowledge-based economy and the region's digital hub, Dubai Government is sparing no effort to ensure that government and citizens are conversant with deploying eServices in all spheres of life. The two new programs 'eCitizen' and 'eEmployee' are in line with the directives to Government Departments to enhance public services through the delivery of eServices of which ICDL certification is a part”. After the Dubai Vision 2010, the emirate has geared in Dubai Strategic Plan 2007 to 2015, inevitably pressing demands on the supporting systems including education to reorient. Instilling the readiness for higher performance workforce becomes a responsibility of the function of education, which is driving educational institutions to
adopt ICT, in many forms of educational technology.

The surge of ICT enabled education has a consequential demand on higher education institutions and similar bodies engaged in such technology to draw on the full potential of technology in education. Institutional change management takes on a whole different meaning in terms of ICT driven change especially in higher educational systems.

There are several challenges in the path of adoption of learning management system (LMS) and adaptation to e-learning. Although there is some research in the area of change management tools, including review of a LMS User training framework by Narwani et al (2008) oriented to the UAE, there are gaps in the body of knowledge. This paper aims to provide an insight to the facets of institutional readiness, challenges of change management and tools to facilitate the process, in the adoption of instructional technologies.

Knowledge Management and ICT: Combined Energy in UAE Higher Education

David and Foray (2002) in their studies associate “knowledge-based communities as agents of economic change”. Characteristic function of knowledge-based community is knowledge-reproduction. Their studies draw that “Knowledge reproduction will then occur through training, practice and simulation techniques”.

To this effect information technology tools and aids are increasingly parceled with the learning and training environments. From simple document processing, to web-based trainings to learning management and evaluation systems, the role of ICT has evolved to support the knowledge reproduction needs of communities. According to the ICT Use Index -2006, the UAE ranks the highest among the GCC countries.

The role of the political leadership has been very strong in promoting the economic and social progress of the UAE as a whole. In their Global Information Technology Report 2002-2003, researchers for the World Economic Forum (WEF), for instance, gave the UAE a full score on the role of its leaders in creating an environment that is conducive to development of information and communication technology (ICT). The country’s goal to establish a framework for an economy encompassing a wide range of knowledge-based industries has gathered momentum due to the UAE’s active participation, and adherence to, international treaties that govern the user and protection of intellectual property – the knowledge economy’s primary currency (Madar 2003).

The ability to invent and innovate, that is to create new knowledge and new ideas that are then embodied in products, processes and organizations, has always served to fuel development. ICT enables this form of knowledge creation and effective manner.

The emirate of Dubai has been at the helm of developments relating to economic diversification within the UAE. The Madar research group studies echo the massive efforts devoted by Dubai to the creation of a world class ICT sector and the promotion of stronger ICT use across all aspects including government, industries, and education, within the emirate. There is an evident endeavor in Dubai towards building a knowledge economy. The visionary establishment of the Dubai Internet City, Dubai Media City, The Knowledge Village and the upcoming Silicon Oasis zones are all laurels to the growth of ICT in the Dubai and the U.A.E overall.

A study by Dr Omar Bin Sulaiman, CEO of Dubai Internet City of the Dubai Vision 2010, envisaged in year 2000, shows that among the Growth of value added industries between 1985 and 1999, the annual average growth of Knowledge Based Industries was the highest. The highlighted elements of a Knowledge
Economy prescribed in his study include, Core Technological competencies and Educated Workforce, in to Intellectual property and Talent management within the environment.

Dubai Vision 2010 is: To Have a stable of world class companies with core knowledge based. Competencies which can compete effectively globally (Sulaiman 2003).

According to the Dubai Vision 2010 master plan; envisaged in the year 2000, by His Highness Sheikh Mohammed Bin Rashid Al Maktoum; are identified three major sectors, which are believed, will play a pivotal role in the prosperity of the local economy in the future. These are tourism, IT and media - in addition to traditional industries such as trade and services, which were behind the emirate’s prosperity over the past few decades.

As part of the 3rd Horizon Growth Strategy of the Dubai Vision 2010, to goal to apply core competencies to new areas is meant to be achieved through the Technology enabled services including Financial, Media, Information technology (IT) and Telecommunications.

The development of the eGovernance, eBanking and eBusiness are all visible outcomes, in addition to the creation of Tejari.com, a Middle-eastern business-to-business online company. The vision upon which the E-Government was launched involves interlinking the economy with government management. Such a link is based on the fact that the modern infrastructure required for eGovernment is the same on which eCommerce is based and through which it will flourish. According to the Dubai eGovernment, the vision upon which the E-Government was launched involves interlinking the economy with government management. Such a link is based on the fact that the modern infrastructure required for eGovernment is the same on which eCommerce is based and through which it will flourish.

The objective of the 3rd Horizon of the Dubai Vision 2010 Growth Strategy is to Seed investment for future competencies by focusing on Research and Development (R & D), Education and Emerging Sectors.

Providers of E-Learning and integrators of e-learning, e-business and e-governments solutions are converging in Dubai. The opportunity that GITEX, the annual Gulf Information Technology Exhibition, hosted by Dubai provides is ample and deeply tapped into by e-learning solution providers.

Towards Knowledge reproduction, retention and engineering, ICT is being capitalized on as the backbone to earn effectiveness, improve efficiency, provide consistency, measure quality and reduce expense.

The technological forces being created within the Emirates, has a special influence on the local environments. The spread information technology and communications technology in the mainstream of business process is strongly linking business excellence to knowledge engineering. With the adoption of new technologies and adaptation of industrial and academic activities to engage in the use of ICT, there is an evident need for support services, including Training and a visible rise in the available modes of training at individual, organization and industry levels.

The ICT sector of the Emirates has evolved, and in this course of evolution, drawn with it the multiple facets of ICT application and Training. Implicitly the education services have rapidly expanded to support the local needs in and inevitably have evolved aligning education with the expedited inculcation of ICT.

With the ever-growing emphasis on Knowledge, Intelligence and management of Intellect, there is a growing pressure on the UAE-based educational system to provide sustainability and preparedness in the generation for the future evolution of competent development.
An example is the ongoing achievement of the Dubai Vision 2010 and the endeavored Dubai Strategic Plan 2007 to 2015, for the emirate of Dubai puts increasing demands on the supporting system. Knowledge management and K-economy are terms driving institutions towards facilitating continuous-learning workforce and ICT is perceived as a strong facilitator for the goal. Institutions both in Education and Commerce are rapidly recognizing the need to induce High Performance Workforce. Instilling the readiness for higher performance workforce becomes a responsibility of the function of education, which is driving educational institutions to adopt ICT, in many forms of educational technology.

**Face of Changes: Cause and Consequences**

With the goal towards building Knowledge based economy supported by ICT, Higher Educational Institutions are being driven to adopt instructional technology and adapt the teaching pedagogy to the effect, by socio-economic and technological forces. In their study David and Foray (2002) highlight the importance of Information technology as a facilitator of the change in learning, teaching and as a whole knowledge creation. Information technologies can affect knowledge creation in a number of different ways. For a start, the mere fact that one has the capacity to create such a wealth of information is truly revolutionary. They draw on the developments as an abstraction and fundamentally the codification of tacit knowledge. Yes, codification eliminates the factors of loss of knowledge owing to memory limitations, however, the codification of tacit knowledge is claimed to partially replace the person who holds and teaches knowledge. Codification helps form a sound basis for the creation of new 'knowledge objects'.

Clark (2006) in his studies draws on Blended Learning as a positive and learner-centric approach that is more sensitive to the real needs of both learner and the context in which learning has to take place. Armed with continuously improved educational technology, teaching ought to change from the traditional teacher-centered, lecture-based instruction to a student-centered, computer-based instruction and to achieve this end, successful technology-supported teacher education programs should be designed and implemented (recommended by UNESCO 2002) (Kadijevich).

The recognition and growing awareness of educational technology usage has been supported by formal standards development, like Educational Technology (ET) standards developed by International Society for Technology in Education (ISTE).

**Educational Technology and its Instructional Peripherals**

From the International Technology Education Association (ITEA) Terms, Educational Technology is using multimedia technologies or audio-visual aids as a tool for enhancing the teaching and learning process. By this definition the term educational technology is not all about Information Technology. A systems view Educational Technology describes learning development and management processes used for designing and evaluating instruction (Banathy, 1996). From the AECT Definition Committee (1972), “Educational Technology is a field involved in the facilitation of human learning through the systematic identification, development, organization, and utilization of learning resources and through the management of these processes” (AECT 1972).

According to Nonaka’s model cited by Marwick (2001), the conversion of tacit to explicit knowledge (externalization) involves forming a shared mental model, then articulating through dialog. Collaboration systems and other groupware (for example, specialized brainstorming applications31) can
support this kind of interaction to some extent.
On-line discussion databases are another potential tool to capture tacit knowledge and to apply it to immediate problems.
The applications and variations of the use of Educational technology cover a large spectrum. Some refer to this as Computer Aided Learning (CAL) and the other side of this coin as Computer Aided Teaching (CAT). Computer led teaching (CLT) is a form of the application of educational technology to the end of replacing the role of the instructor in the paradigm and enabling the learner to use technology to acquire knowledge from, of course, knowledge in its codified form.
From the recognition of online learning the role of ICT has moved in leaps and bounds across the Emirates. Starting with off-the-shelf learning content, teaching bodies have evolved in their use of ICT to develop SCORM / IMS compliant learning objects which are reusable across systems and platforms.
The Sharable Content Object Reference Model (SCORM) is a collection of specifications that enable interoperability, accessibility and reusability of web-based learning content. Other similar concept based interoperable formats are also commonly used for creation of digital learning content.
Kaplan-Leiserson provides the following definition of LMS:

*LMS (learning management system): Software that automates the administration of training events. The LMS registers users, tracks courses in a catalog, and records data from learners; it also provides reports to management. An LMS is typically designed to handle courses by multiple publishers and providers. It usually doesn't include its own authoring capabilities; instead, it focuses on managing courses created by a variety of other sources.*

**Change Management Tools: Facilitating Adoption and Adaptation**

According to Farrow (1997) change brings with it packaged fears, and in her study set in the information and library sector, it soon became apparent that the best way to manage these fears is through communication and training.
Research is ample across ICT and non-ICT industries on the constructive role of training as a change management tool. The process of learning and knowledge sharing in managing change often takes shape in forms of training and development. Research by Spacey et. al. (2003) in the space of UK based Libraries affected by developments affecting the growth of ICT in public libraries, highlight that resistance can arise because of the way new technology was introduced and that training is an appropriate means of enabling staff to cope with technological change.
The study by Kempton (1996) reports the importance of the training strategy, which was required to facilitate the important organizational change and establish it as a new culture at Kingston Hospital. The evidence provided by study by Kempton (1996) strongly suggests that training made an important contribution to facilitating major organizational change. The concept of training for organizational success can be extended to cater to the needs of academic institutions faced by the challenges of ICT triggered changes.
The management of change needs to be approached in a logical and structured manner (Farrow 1997). An in-depth study on the role of training needs analysis in organizational change by Reed and Vakola (2006) draws light on the challenges faced by organizations in transition. Fears among the ICT users, resistance to adoption, and misunderstanding of technology support are some of the visible obstacles that change management are expected to handle.
Schein (1999) states that his thinking on change has evolved from a model of planned changes to a concept of managed learning. For ICT systems to be successful, it is suggested staff need positive attitudes to ICT (Evald 1996). Applying this understanding to an individual’s acceptance of information systems, the Technology Acceptance Model (TAM) (Davis 1989) suggested attitude influences behavioral intention to use, and subsequent actual use. TAM also includes the constructs of perceived usefulness and perceived ease of use. Studies utilizing the TAM to consider the effect of variables such as training on the use of computers and information systems have found that training does exert an influence.

Research indicates that training has a positive role to play in acclimatizing people to changes taking place around them. It can assist in the process of demystifying technology, although it is important to note that technoprobes – those with an extreme fear or anxiety of computers – may need specialized training prior to general ICT training. The relationship between training and attitudes is less controversial and training is seen as an appropriate technique to change attitudes towards ICT (Spacey et al. 2003).

**Success Factors and Barriers to Adoption of Educational Technology**

An educationist engaged with learning management systems, or a technologist involved in the implementation of learning management systems, or someone who identifies with the likes of any of these, would not find it difficult to recognize the challenges surrounding the successful adoption of a learning management system (LMS) implementation in an educational environment, many of which have been identified and classified by Narwani et al (2007) from a project implementer’s perspective.

Faced by challenges related to the institutional readiness, user adoption, teaching methodologies, technical and some social factors, Higher education institutions are visibly striving to train their user base. The absence of user-readiness, user responsiveness, frequently changing faculty, low user IT competency, language barriers make it increasingly necessary to have a realistic training approach in order to facilitate the adoption of educational technology, for instance in the form of learning management system (LMS) across a University.

The conduciveness of institutional environment for meaningful and effective adoption of LMS is not independent of the external socio-economic, cultural, technological and political factors.

All this in the backdrop puts increased pressure on need for effective Blackboard User-training. The approaches to training users are multiple, yet there are key common elements which go into the planning of a training oriented towards Blackboard users. The manner in which the training is evaluated has a close relationship with the effectiveness of the training itself. There is a need for a practical framework to guide the process of planning such a Blackboard user-training and its absence in the current UAE-based Blackboard-consumer zone is visible.

**Training as a Catalyst in Adaptation**

Simplistically, Teaching and learning are the give and take functions of the educational system. There is much theoretical and practical evidence to support the perspective that Computer-aided learning and Computer-aided Teaching are interpreted to be two sides of the same coin.

Educational technology and information technology implementations for support the educational process often face this challenge of having to address the different needs of the learning through IT and teaching with IT.
Training may be interpreted as a form of ‘Knowledge Transfer’, which is used to transmit and extend expert information on a specific matter to subjects who are assumed to know less about the matter than the subject-matter expert expected to train them. Ellis describes transfer of learning as the experience or performance of one task that influences performance on some other task (Ellis 1965). In the context of this inquiry, training would lead to some subsequent task that, may for example, be carried out at the workplace. Three forms of ‘transfer’ were identified:

1. Positive Transfer, in which performance on one task facilitates a second task
2. Negative Transfer, in which performance of one task inhibits another
3. Zero Transfer, wherein no effect occurs or the effects effectively cancel one another

Ellis also describes the major issues associated with transfer (Ellis 1958):
- Research methodologies and measurement techniques for transfer
- Specification of transfer variables and their influence
- Development of updated conceptual models and theoretical structures
- Educational technology developments which can be applied to a greater spectrum of evolving and changing training problems and issues

As a success factor the extent and effectiveness of knowledge ‘transfer’ is a useful reference point to examine the results training and potential for enhancing competency levels.

Training is a process of updating the knowledge, developing skills, bringing about attitudinal and behavioral changes, and improving the ability of the trainee to perform his/her tasks efficiently and effectively (Palo and Padhi 2003).

“The approaches to generic training are multiple; however, there are characteristic elements, which go into the planning of a training oriented towards users of education technology” (Narwani et al 2008 pending).

Training, a possible determinant of organizational performance, which is driven towards Knowledge engineering, is not necessarily a function of the HRM, but providing the necessary support and direction to encourage training initiatives is foresight of the HRM in organizations.

Training for organizational performance improvement takes a different meaning if the organization is a higher educational institution.

The uniqueness of the training needs are made obvious by a examination of the underlying principles of the Blackboard LMS User training framework by Narwani (2007) which are fundamentally based on characteristics of the end-user targeted by the trainings. In Narwani (2007) framework the working principle derives prescriptions in the form of training components based on top-level variables and determinants associated with the training audience. Educational technology users have varying IT skill levels and different reaction levels which need to be understood in order to effectively transfer the trainings objectives into realistic training outcomes.
Conclusion

Knowledge management (KM) and Knowledge economy (KE) are terms driving institutions towards fostering continuous-learning workforce, and Information Communication Technology (ICT) is perceived as a strong facilitator for this goal. The consequential influences of this drive are considered as the K-factor in this study, which brings with it, propogative and overwhelming changes. Institutions both in Education and Commerce are rapidly recognizing the need to induce High Performance Workforce. Instilling the readiness for higher performance workforce becomes a responsibility of the function of education, which is, among other reasons, driving educational institutions to adopt ICT in the form of educational technology. The research provides evidence of a strong link between Knowledge reproduction and the intrinsic use of ICT and consequent need for training as a change management tool in the dynamic institutions.

Economic, social and technological forces are pressing demands on UAE-based educational institutions and calling for sophisticated yet flexible electronic learning management systems to cater to the ever-changing learning needs.

With the ever-growing emphasis on Knowledge, Intelligence and management of Intellect, there is a growing pressure on the UAE-based educational system to provide sustainability and preparedness in the generation for the future evolution of competent development.

The study is set in the context of the UAE Higher education environment, with evidence of advent of Knowledge-economy based practices and initiatives propelling the inculation of educational technology. Led by the need of the environment, accreditation requirements include the use of a learning management system (LMS). With the increasing adoption of educational technology intended to support academic work in the Higher Educational Institutions in the UAE, there is, although ironic, an increasing demand on academic users to quickly learn and make effective use of the technology at their disposal. It is not expected for the LMS to intelligently evolve and adapt to the changing human learning needs, however, it can be desired to customize the system to adjust itself to procedures and requirements of the learning environment (Narwani and Arif 2007). Established research indicates that effective adaptation to technology is enabled by sensible change management. It is noted that training is among the key facilitators for effective change management. “End-user Training is a facilitator of improving the level of utilization of the LMS and for enabling end-users to gain more by the effective use of the system. The end-users of the LMS are part of the academia and administrative functions of the Educational Institution. Institutions are faced with the challenge of defining their dynamic training needs and developing training strategy that are aligned to the business objectives, environment and organizational culture.” (Narwani 2007).
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Oman’s Online Teacher Training: Making a Capacity Building Partnership Work

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Abstract

Information and communication technology (ICT) capacity building enables countries to become self-sufficient in the production of quality e-learning. The Oman Online Teacher Training (OOTT) project, an international partnership between the Sultanate of Oman and the United States of America, involved pilot testing the development and implementation of e-learning. One goal of the project was to build capacity within Oman’s Ministry of Education for future online training.

The OOTT project presented a number of challenges and learning opportunities for both the Omani team members and their U.S. counterparts. Challenges in areas of communication, infrastructure, schedules, approaches to education, and expectations all needed to be overcome to successfully complete the pilot and transfer the necessary skills to the Omani team. This presentation describes capacity building challenges confronted by this partnership opportunity, the solutions implemented, lessons learned, and recommendations to make future projects more effective and sustainable in Oman and other contexts with similar circumstances.

Introduction

In the field of international education development, building local capacity to enable a country to become self-sufficient is a common goal. Capacity building often requires a combination of education, increasingly demanding supervised experiences, coaching, and mentoring. When the area of capacity building in educational technology—specifically the design, development, and delivery of online teacher training—the complexity of the task can increase dramatically.

The Oman Online Teacher Training (OOTT) project, an international partnership between the Sultanate of Oman and the United States of America, involved pilot testing the development and implementation of e-learning. One goal of the project was to build capacity within Oman’s Ministry of Education (MOE) for future design, development, and delivery of online teacher training courses.

The OOTT project presented a number of challenges and learning opportunities for both the Omani team members and their U.S. counterparts. Challenges in areas of communication, schedules, approaches to education, and expectations all needed to be overcome to successfully complete the pilot and transfer the necessary skills to the Omani team.

Below, the authors provide an orientation to the OOTT project, outline project activities, and describe the international and Omani project team structures. In addition, they reveal concerns that existed prior to the start
of the project, challenges confronted in addressing these concerns, and lessons learned.

**Background**

Much like many countries in the Middle East, the Sultanate of Oman (Oman) is implementing substantial and wide-reaching educational reforms. Eager to prepare its students to compete effectively in global higher education and commerce markets, Oman’s education reforms include examination and evaluation of the role of information and communication technologies (ICTs).

Oman, with a population of approximately 2.3 million, is located on the Arabian Peninsula and shares borders with Yemen, Saudi Arabia, and United Arab Emirates. Nearly a quarter of its population is comprised of expatriates (many are temporary workers) and almost half of the country’s residents are under 18 years of age (Ministry of National Economy 2003: p. 3).

To prepare its young population for the future, Oman has undertaken efforts to provide continuing professional development opportunities for its teachers and to modernize both training methods and content. One such effort, the Oman Online Teacher Training (OOTT) project, involved a limited pilot test of the development and implementation of e-learning.

The OOTT project was funded by the U.S. Department of State's Middle East Partnership Initiative (MEPI) in partnership with the Omani Ministry of Education. It was implemented over a 17-month period, between February 20, 2006 and July 31, 2007. Under MEPI, the United States and Middle East countries, such as Oman, partner in funding programs to bring about structural and institutional reform in the Middle East so “democracy can spread, education can thrive, economies can grow, and women can be empowered” (http://mepi.state.gov/). OOTT was managed by Creative Associates International Incorporated (Creative: http://www.caii.com/) based in Washington, D.C. Seward Incorporated International (Seward: http://international.sewardinc.com/), which is based in Minneapolis, Minnesota, was sub-contracted to implement the project.

**Project Team**

As the name implies, MEPI is a partnership between countries. As part of this partnership, the OOTT project required contributions from the governments of both the U.S. and Oman. Much of this support came in the form of project personnel. These individuals were selected because of the experience and expertise they could bring to the project, and/or because of their responsibilities within the MOE.

**The Omani Team**

The Oman MOE assigned 12 staff to participate, on a part-time basis, in the design and development of the online training. Six of these individuals brought subject matter expertise—two each from the areas of math, science, and English instruction at the secondary-school level. Three brought expertise in teacher training within Oman. The remaining three represented technical skills in graphics, programming, and computer lab and network operation. It was understood these individuals would become the core team responsible for assisting the MOE in future online teacher training initiatives.

As a result of their participation, the Omani team members were to develop the knowledge and skills necessary for the creation and use of online training. Specifically, the MOE team members would experience and assimilate methods for the production of online learning: systematic instructional design, online learning materials development, project management, online
training implementation, and project evaluation techniques.

**The US Team**

As mentioned above, Seward Incorporated International was contracted to provide the ICT expertise from the U.S. Seward has more than 18 years of experience designing technology-based learning solutions in countries around the world. Seward provided expertise in the design, development, implementation, and evaluation of online learning. Over the life of the project, Seward’s team involved more than 20 individuals with expertise in project management, instructional design, computer programming, graphic design, video production, curriculum development, print design, editing, evaluation, and Arabic (translation and localization).

**Project Activities**

The project design specified a set of deliverables or final work products. While not an exhaustive list of ICT in education, these deliverables became the vehicles for ensuring appropriate capacity building activities would take place. Modeling, mentoring, and coaching activities were built into the successful completion of each work product. The project’s deliverables were:

1. A conceptual framework for the design and implementation of the Internet-based, in-service teacher training;
2. Video footage featuring active teaching and learning approaches to include in media-rich, Internet-based teacher training modules;
3. Pedagogically sound, subject-specific teacher training and classroom implementation materials for three Internet-based modules that utilize research-based teaching and learning strategies;
4. Training programs designed to build the skills and capabilities of the MOE project staff;
5. The implementation and evaluation of an in-service teacher training program in three pilot schools with 15 teachers (five from each of three subject areas); and
6. A report on the development of the Internet-based teacher training modules and on the implementation of the teacher training in the pilot schools.

Throughout the project, the Seward project team applied work practices that ensured the Oman team was developing the required competencies. Then, a gradual transfer of responsibility to the Oman team for the completion of each deliverable was implemented. This approach was undertaken to ensure that the Oman team developed and could apply the skills needed to proceed with ICT activities when the project ended.

**Misconceptions**

International development work, by its nature, is full of challenges. Fortunately, some of the challenges anticipated for the OOTT project did not materialize. This situation contributed to the ease of work and the overall success of the project. Several of these misconceptions are briefly discussed below.

**Gender and Team Roles**

Seward’s project team consisted of both men and women. Because of the stereotypes held by many Americans, there was initial apprehension among some team members that this would not be a functional structure in an Arab and Islamic country. For example, there was concern that women would not be taken seriously and given the respect needed to be successful in a capacity-building role. This was not the case. In fact, the Seward project team quickly learned that women hold many
leadership positions within the Oman MOE, and almost half the Omanis appointed to our team were female.

**Arabic and English**

Language also turned out to be much less of a challenge than anticipated. The Seward project team had limited Arabic language skills. In recent years, however, Oman has recognized English as the language of international business and has made efforts to develop the English language skills of its citizens. Most of the Omani team members were fluent in English. The remaining members had conversational English skills that they were eager to develop further. To expedite the work flow, first drafts of all work were completed in English and later translated to Arabic.

**Safety and Security**

Unfortunately, when Americans think of the Middle East they are afraid. Images and reports of violence immediately come to mind. Fortunately, that is not the case in Oman and most other countries in the region. The Seward project team quickly found that Oman has a peaceful and gracious society. With nearly a quarter of Oman’s population being from other countries, and a growing tourism industry, Omanis are accustomed to welcoming foreigners. Seward project team members were able to move freely throughout the country without any concerns for their safety.

**Challenges**

While many of the prior misconceptions did not materialize into problems, the team did face a number of challenges. However, none of these individual problems threatened the project. Collectively, however, the challenges presented a significant obstacle to the project’s success. The challenges, and the team’s responses, are described below.

**Schedules**

In a typical project, team members work on the same schedule—they work the same days of the week, arrive and leave work at the same time, and have the same holidays from work. The nature of the MEPI partnership resulted in team members working on different continents and living in different cultures. Unfortunately, the OOTT project budget did not provide sufficient funds for all of the team members to leave and work in a single location for the duration of the project. This situation created a number of challenges with collaboration and capacity building. In spite of over forty individual trips to Oman during the project, the Minnesota-based team members did most of their work remotely. Planning and executing the work of the geographically-distributed team was compounded by the need to accommodate two radically different work schedules.

Differences in schedules included:

- Oman and Minnesota are nine time zones apart. When the workday ended at 2:30 p.m. in Oman, it was only 5:30 a.m. in Minnesota.

- In Oman the workday is from 7:30 a.m. to 2:30 p.m., the U.S. team was more accustomed to a workday of 8:00 a.m. to 5:00 p.m.

- The Oman workweek is from Saturday through Wednesday. The standard workweek for the U.S. team was Monday through Friday.

- The Oman team members typically have eight or more weeks of vacation per year. The U.S. team members typically have three weeks of vacation per year.

- Muslim holidays such as Ramadan and Eids are celebrated in Oman, while Christian holidays such as Christmas and Easter are celebrated in the U.S.
All team members made compromises to get the work schedules to function as well as possible. Omanis worked extended days and weeks as needed to meet the production time table. Working overtime is not common in Oman and demonstrated a real commitment by the team members. Seward project team members also flexed their schedules, often working weekends and holidays to be in sync with the Omani schedule. Also, adjustments to workflow were made so that the time zone and workweek differences would be minimized.

Communications
Clear, concise, and frequent communications are critical to the success of any project. To work efficiently, team leaders and team members need to be able to quickly share information, ask and answer questions, and document decisions. The Seward project team members came to the OOTT project from a computer, Internet, and networked technology work environment. E-mail and instant messaging were their primary means of project-related communications. As an alternative, they would pick up a phone and make a call. The Omani team members were much less dependent on computers for communication. Within the MOE, written letters delivered by courier are the primary means of communicating important information. Less formal communications are made using phone-based text messaging. Use of e-mail is not an expected job skill or requirement. Computer-based communications are not a standard practice for work-related activities. With team members often working at great distances, an effective means of communication was required. Omani team members adapted quickly, making use of their personal Yahoo and Hotmail accounts as the primary means of communicating about the project and sharing work documents. When the Seward project team was in Oman to work, they learned to be more reliant on phone-based text messaging to contact team members and to set up meetings.

Translation
The online teacher training developed for the OOTT project consisted of 13 tutorials on active learning techniques, and training on the implementation of 3-week instructional modules in math, science, and English classrooms. The modules incorporated and made use of the active learning methods. All of these online materials, and the supporting teacher’s guides, which were used during the classroom implementation portion of the pilot, were available in both Arabic and English (with the exception of the English module and classroom materials, which were in English only).

All of the design work and content writing was originally completed in English. The translation from English to Arabic presented some challenges. Since many of the active learning- and technology-related concepts were new to Oman, there were no universally accepted Arabic equivalents.

Since our translations workflow involved a series of native Arabic speaking reviewers, a number of discussions arose around proper translations. Some translators preferred to go with very literal translations, others favored conceptually focused phrasing. For example, “journaling” was translated as “note taking,” and “active learning” was translated as “effective learning.” Neither of these translations did justice to the original English word. Achieving consensus as to an appropriate translation was often time consuming and the team was required, in a few instances, to use a translation that was not accepted by everyone involved. A few words, such as “brainstorming” and “rubric” were particularly difficult to translate accurately. The translation process that worked best was to have the professional translator complete a
draft, have a second translator review it, have the Omani team members review the edited draft and identify continuing areas of concern, and then to check with the MOE for a standard. If none existed, the project team would rely on the recommendation of the Omani team members.

Oman’s Readiness
Recognizing the emerging and evolving nature of ICT, Oman was anxious to explore the potential of online teacher training. The fact that this was a pilot project provided the opportunity to test Oman’s readiness for online learning.

In recent years, Oman has invested heavily to install wireless computer labs in its secondary schools, develop a central IT team, and install centralized servers at the MOE. Working with the country’s telecom company, Omantel, the MOE has connected nearly all of its schools to the Internet with ADSL lines.

As a result of this rapid ICT expansion and emerging infrastructure, the MOE has been unable to put in place sufficient policies and procedures to maintain hardware and connectivity at levels appropriate for effective online delivery of teacher training. In the schools visited by the OOTT project team, the majority of computers had viruses on them, sometimes to such an extent that rendered the computers inoperative. In addition, the wireless technology in the schools was often inadequate for the size of the facilities and was frequently not working.

Prior to and throughout the pilot, team members visited the pilot schools to get them operational and to keep the system running. The MOE IT team was also contacted, and their support was solicited in this effort. The process of reviewing school ICT infrastructures and providing support services helped to build awareness of critical issues related to use of ICT in schools among the Omani team members.

Expectations
As they joined the project team, many of the Omanis had expectations of what they would learn and the experiences they would have. Unfortunately, project demands and budget limitations challenged the team’s ability to meet all of these expectations.

Team members with a technology focus—the graphic artist, programmer, and networking professional—were the ones who faced the greatest challenge to achieving their goals. The physical separation from the Seward development team and the extremely aggressive development time table prevented the team from being more fully immersed in the product development functions.

Instead of developing the capacity for full software production capacity within the Oman team, it was decided early in the project that providing Oman with a Learning Content Management System (LCMS) was the most efficient path to sustainability of their online teacher training initiative. The decision to implement this solution was based on the need to reduce the MOE’s dependence on developers to produce future online courses.

Instead of building development capacity (i.e. programming and web development), an effort was made to identify a role for the technical members of the team that could be achieved given the available resources. That role was in supporting development of the resources (e.g., graphics, animations, audio clips, and videos) needed to enrich and enhance course content. These digital assets would then be integrated into course presentation via the LCMS page template development structure.
Conclusion

This international partnership was a true learning experience for everyone involved on the ICT teams. Growth took place at both personal and professional levels. Valuable lessons have been learned that will serve the team members as they continue in their work in Oman, the United States, or elsewhere.

On a personal level, the close working relationships created by the project’s activities benefited both the Oman team members and those from Seward. Misconceptions were dismissed and more accurate understandings replaced them. The interchange between cultures helped everyone involved to expand and clarify their worldviews.

On a professional level there were a number of major lessons learned about international partnerships. These include:

1. Responsibility for completion of the work needs to be shared equally. Successful completion of the OOTT project required true collaboration—shared workloads with a common time table. This in turn required everyone, on occasion, to make and accept compromises.

2. Flexibility is an essential skill. Accommodating different time zones, workdays, work weeks, holidays, etc. required changing “normal” work processes.

3. A solution did not exist for every problem that may be encountered. In some situations, such as with the resolution of translation issues, the U.S. team needed to define and implement new processes for the project to move forward.

4. Some challenges are beyond your sphere of influence. Issues such as technical infrastructure had a direct influence on the potential success of the project. However, the team could not resolve these issues. Instead, the team needed to concentrate efforts on the issues they could influence.

As a result of the OOTT project, an Omani team has acquired the necessary knowledge and skills to produce online teacher training. They are now ready, not only to expand on the pilot project, but to create and manage new online training projects for other purposes.

However, the feasibility of online training in Oman is another question. The pilot revealed a number of serious infrastructure issues that need to be addressed before large-scale, online training can be successfully implemented. The Ministry of Education appears to be carefully addressing these issues, and their online training team will be ready when the infrastructure is complete.

Following the Pilot Project

In today’s fast-paced world, developing, implementing, and sustaining e-learning projects within an organization is crucial to building employees’ competency. This is a fact the Oman MOE appears to understand because of their exploratory efforts in the area of e-learning. However, even after e-learning projects have been successfully implemented, sustaining the online training turns out to be a struggle. There may be many reasons for this, but chief among them is that no strategic plan has been developed to guide the integration of e-learning into the ministry’s programs. In addition, no actions have been taken to overcome the technical and infrastructure challenges identified during the pilot implementations.

In the eighteen months following the OOTT project, despite the efforts of the Omani team to develop and expand the online teacher training project, no progress has been achieved. The Omani team did present a proposal to develop more training modules and expand the implementation of the project in schools in Muscat while the infrastructure
in the regions was developed. This proposal was initially accepted and supported by the MOE leadership. However, progress toward the proposed goal was hindered by the lack of collaboration between the different departments responsible to provide the necessary technical and administrative support. It has become clear to the Omani team members that sustainability of e-learning projects requires a united, thoughtfully structured, and supported effort. This includes adopting a systematic approach to overcoming the challenges that face this new innovation. This involves careful long-term strategic planning, providing a stable and reliable infrastructure, raising awareness among all participants through marketing and education efforts, and the allocation and support of human resources.
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MyLearningSpace: A New Model for e-Learning Based on Mashups

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Introduction

Web 2.0 describes the changing trends in the use of World Wide Web technology and web design that aim to enhance creativity, secure information sharing, collaboration and functionality of the web. Web 2.0 concepts have led to the development and evolution of web-based communities and hosted services, such as social-networking sites, video sharing sites, wikis, blogs. The term E-Learning 2.0 is used to refer to new ways of thinking about E-learning inspired by the emergence of Web 2.0. It is defined as a planned teaching/learning experience that uses a wide range of technologies, mainly Internet or computer-based, to reach learners. E-learning is important for several reasons. First, course materials are published online for students all over the world can access. Second, the ability to build in tools that offer students with resources they may never have seen in a traditional classroom. Third, it offers the possibility of an unlimited number of participants with a maximum range of E-learning styles, preferences, and needs. Moreover, it develops social skills, aids mainstreaming of handicapped students. Consequently, we recognize the learners’ needs to develop a system that achieve their dreams and facilitate the learning process. We decide to develop this system to gather all the learning resources at one place.

Background

According to Aaron Boodman, quoted in Business Week online,

"The Web was originally designed to be mashed up. The technology is finally growing up and making it possible."

A mash-up is a Web page or application that combines elements from two or more sources. While The origin of the term 'Mash-up' stems from the world of music where the term was used to refer to a music that was formed by the combination of several music but the resultant music differs from the original sources and consequently come up with a completely new style of music. Recently the term mashups is also being used by the software professionals to refer to the merging of several software programs together. For example, you can combine Google Earth and YouTube to have a world map with different video segments from all over the world. There are two Types of Mashup: Presentation-centric mashup, which is a Mashup related to presentation of something. The Google Maps are the examples of presentation-centric mash ups. Data-centric mash ups, merges two or more services to create an integration point that serves a true business process. The history of mash ups then got a deep-rooting when it was brought into the world of
Web 2.0. It is the term that describes a second generation of the World Wide Web that is focused on the ability to collaborate and share information online. Mashups could be used in several innovative ways and you would get interesting outputs if you can use those creatively. The New Media Consortium (NMC) estimates that it will take 2 to 3 years for mashups to become part of the mainstream for “teaching, learning, or creative applications.” When we apply mashups in E-learning we will gather any combination of text, graphics, audio, video and animation combined from existing files to help learners get their need faster as we shown in figure 1. Moreover, applying mashups in E-learning increases participation and interaction with your social networking spaces. It is beneficial for school or college as an excellent display for presentations.

Finally, Mashup is the revolutionary technology that may bring change to e-learning and accelerate the learning process. It will be an attractive method for instructors to apply to help their students.

**Motivation**
The usage of the internet is incredibly increased as in next table.
As a consequence, number of e-learning website. For example when searching at Google using e-learning site as a key word, we will find 4,370,000 for relearning site.

Unfortunately, the increase of learning resources on the World Wide Web leads to the difficulty to gather resources among learners. The learner won't benefit from them correctly, because the use of so many services at the same time and at many browsers misleads the learner. Sometimes, the learner has no time to search for his/her material in all resources. Also, the difficulty in exchanging experiences and skills among learners is a barrier to solve their problems and find the appropriate solution. There is another point we find it in e-learning system these days, each service doesn't meet the requirements and interests of the learner. These problems and others push us to implement this system “e-learning space” to facilitate the learning process. E-learning space gathers information from a lot of resources, so, it saves time and efforts. It also provides the possibility of learning in groups, which allows for learner to take the summary of others’ experiences and discover the facts by practicing. In addition, “e-learning space” doesn't only provide the learner with the available service, but it filters and combines service to make up a new service. Moreover, it helps to do what the learner wants i.e. do mash up. A unique advantage of “e-learning space” is providing the learner with the new and appropriate things for educational ethics .Furthermore, “e-learning space” Makes learning funnier for the learners.

### Related Work

There are many tools and instruments that have also been developed over the years since e-learning first came into existence. To enhance distance learning, the current use of features such as MP3 files and streamed video recorded lectures are often added to a curriculum.

These features allow instant and anytime access to information. This is quite important bonus since E-Learning through online learning courses may consist of students from around the world in any time zone. It had not been for the continuous and convenient advances throughout the history of E-Learning, it is doubtful it would have ever caught on as well as it has.

One of the projects that based on E-learning is OpenLearn .OL is a website that gives free access to course materials from the Open University. It is online learning that is opened to anyone and anywhere in the world. There are 11 topic areas, from arts to science and the learner can discuss these topics with other online learners in forums. In addition, learner

### Table 1: World Internet Usage and Population statistics

<table>
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</tr>
</thead>
<tbody>
<tr>
<td>Africa</td>
<td>893,197,200</td>
<td>4,514,400</td>
<td>12,937,100</td>
<td>186.6</td>
<td>1.6</td>
</tr>
<tr>
<td>Asia</td>
<td>3,607,499,800</td>
<td>114,303,000</td>
<td>257,898,314</td>
<td>125.6</td>
<td>31.7</td>
</tr>
<tr>
<td>Europe</td>
<td>730,894,078</td>
<td>103,096,093</td>
<td>230,886,424</td>
<td>124.0</td>
<td>28.4</td>
</tr>
<tr>
<td>Middle East</td>
<td>258,993,600</td>
<td>5,284,800</td>
<td>17,325,900</td>
<td>227.8</td>
<td>2.1</td>
</tr>
<tr>
<td>North America</td>
<td>325,246,100</td>
<td>108,096,800</td>
<td>222,165,659</td>
<td>105.5</td>
<td>27.3</td>
</tr>
<tr>
<td>Latin America / Caribbean</td>
<td>541,775,800</td>
<td>18,068,919</td>
<td>55,930,974</td>
<td>209.5</td>
<td>6.9</td>
</tr>
<tr>
<td>Oceania</td>
<td>32,540,909</td>
<td>7,619,500</td>
<td>15,787,221</td>
<td>107.2</td>
<td>1.9</td>
</tr>
<tr>
<td>World Total</td>
<td>6,390,147,487</td>
<td>360,983,512</td>
<td>812,931,592</td>
<td>125.2</td>
<td>100.0</td>
</tr>
</tbody>
</table>

*Internet Usage and World Population Statistics are for June 30, 2008. Internet usage information comes from data published by Nielsen//Net Ratings, by the International Telecommunications Union, by local NIC, and other reliable sources. Copyright © 2001 - 2008, Miniwatts Marketing Group. All rights reserved worldwide.*
can join and set up his/her own video conferences to meet online learners from anywhere in the world or chat online using text chat, completing self assessment exercises where he/she controls the answer when it is revealed. He can also assess his/her progress by keeping an online learning journal.

Another example is MyLearningSpace. It is a global community of educators in which they can exchange ideas about innovative teaching, share resources and work together in groups. This site contains blogs for teachers' conversations and discussions, provided (released in) with 11 different languages and it informs the user with events, conferences and competitions, and the location of each one.

The learner can create his/her own page, search and download video, access to other members' names and countries, create and organize any group and define what groups and/or videos he/she would like to display on his/her page. While many doubts take place that e-learning will satisfy the real learning experience in the absence of the relation between the student and the teacher, it cannot be denied that e-learning have millions of advantages because there is not certain age scale. It is also directed for children from early ages. In addition, almost every institution has now reached some advance in the use of e-learning system. Finally, it is obvious that the e-learning system showed nothing but progressive growth.

**Proposed System**

With the advent of mashups, and the various techniques provided by Web 2.0 technology, e-learning can take a different new model. This model provides convenient environment or space for each learner, giving him/her the ability to control and customize his/her space according to his/her educational level, needs, experiences and requirements. The learner will be capable to take the maximum advantages and benefits from the available Web Services, and even the new services created by mash up techniques.

Since Web 2.0 is mainly concerned about collaborating, communicating, creating and contributing, social networking is considered to be one of the most advantages of Web 2.0 technology. Learners will have the ability to communicate with each other, share knowledge among them, and benefit from their experiences; therefore, knowledge and information will pass through learners, creating new learning techniques that aim to raise educational levels.

This model will also provide searching technique. This technique aids the learner in finding and locating his/her demand. Searching results will be passed through filtering process; therefore, these results will be presented to the learner in a form that meets his/her needs and requirements.
Conclusion
Hanna fin, Land, and Oliver (1999) have stressed the fact that with the expected growth of both information and technology, new models for instructional design have to be sought. One of the models was e-learning. It is a technological revolution that helps learners throughout the world. It is a way to share information and cooperate with students from different countries. Learners may benefit from the services provided in the e-learning website. It saves time and accelerates and facilitates the learning process. Instructors should participate in these sites to guide their students and embodied their role in the society as guiders.
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A Model for e-Learning Personalization

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Abstract

With the facility to connect people and information around the world, the Internet is before now having a major impact on the traditional education. Currently, students can easily access the online course materials anytime anywhere. Internet also amplifies the complication of the course materials development, as the learning idea is taken by a student in the e-learning environment, traditional teacher determined learning model is no longer appropriate. as a result, student-centered course materials which are prepared based on individual student’s learning expectation, styles, interests and individual academic background become critical. In this paper, we introduce a model for personalized course material generation through 1) student learning styles, 2) student learning interests and 3) student devices, such as personal profiles fig.1, to help understand students’ behaviors so as to materialize the concept of personalization.

Keywords: e-Learning, personalization, profile, device, learning style, interest.

Introduction

Over the past years, information personalization has provided several valuable achievements on the improvement and optimization of Web searching, eLearning and recommendation taking into account user’s interests, preferences and contextual information. Personalization is also closely linked to navigation and visualization. Personalization can be defined as a correspondence between implicit and explicit users’ needs, and the response given to these needs. In other words, and as stated by: "the challenge in an information-rich world is not only to make information available to people at any time, at any place, with any device, and in any form, but specifically to say the right thing at the right time in the right way". Amongst many successful examples, the domain of e-commerce has been a privileged personalization application domain on the Web, with many successful examples developed such as the well-known Amazon system. Static user information refers to basic characteristics explicitly presented by the user during a registration procedure; while dynamic user information is collected through observing user’s behaviors.

eLearning personalization systems and information retrieval algorithms are some of the main background techniques used so far. Semantic approaches use ontologies or personalization techniques to match users’ needs. The main objective of personalization system is to perform an information retrieval process taking account the perception, learning styles and the interest of the end-users.

Literature Review

Inkpen (1999) points out that handheld technology can provide access to computing at the places where children’s activities and learning occur, unlike desktop computers which are often segregated from other
learning activities in the classroom. Flexible access means opportunities to integrate learning technology into children’s daily activities (e.g. the success of handheld toys like Gameboy™ and Tamagotchi™), where the products themselves become part of the children’s culture.


They offer a broad approach to personalisation in their work, focusing on the need for metadata and privacy standards. The authors propose that use of these standards will allow for greater interoperability and automation in data exchange, and use the recommendations of the World Wide Web Consortium (W3C) to create their vision.

User profiles are also used to deliver personalised content to the user. The system utilises ‘like-minded groups’ to associate preferences and utilises user profiles in the discovery of resources by actively seeking information on the web that matches the profiles.

Bonnet, Monica. “Personalization of Web Services: Opportunities and Challenges.” (2001). It provides a good starting point for a look at personalisation, explaining both terminology and technology. Bonnet begins by looking at why services use personalisation, concluding that the ultimate aim of personalisation is user satisfaction. She highlighting the fact that a personalised service is not necessarily based on individual user behaviour but can be drawn from previous research with a predefined audience base [6].

Hayhoe (2001), he shows the most significant design restrictions of palmtops are the small display screen, and the limited brightness and contrast. His guidelines for dealing with this include the following:

- Realize that reading online at low resolution reduces reading comprehension significantly
- Think in terms of nuggets or specks, not chunks
- Be prepared to display text in larger type than you are accustomed to seeing in documents designed to be read on the desktop
- Apply bold, italics and colour with caution
- Don’t expect to have access to a large variety of fonts
- Employ graphics in very minor supporting roles rather than as a primary means of communicating information.
- Don’t assume that other supporting media will be available
- Remember that most of the current installed bases of handheld and wireless devices have very modest capabilities
- When designing for a particular installed base, consider the capabilities of the standard device in design decisions
- When designing Web pages for reading on handheld devices, remember that the screen orientation is portrait not landscape, and that the screen width is very narrow.

Junii (2002) gives an overview of palmtop hardware and software applications relevant to education in 2002 for the PalmOS® and Microsoft® Windows CE palmtops. Uses include grading and attendance, assessment portfolios, fitness and wellness assessment, lesson planning organisation, and quiz-writing used in an exercise room or outside. There are also generic palmtop applications: word-processing, spreadsheet, database, eBooks and web browsing.

Mohamed Ally (2006) show that Mobile learning devices can be used to deliver
learning materials to students, but the materials must be designed properly to compensate for the small screen size of the devices. Learning materials need to use multimedia strategies that are information-rich rather than textual strategies. As a result, the writing style of course developers has to change from textual writing to a greater use of visuals, photographs, videos and audio.

Athanasios D et al (2006). They show that GIS learning object selection problem is an intelligent topology-based GIS learning systems, by proposing a methodology that instead of “forcing” an instructional designer to manually define the set of selection rules; produces a decision model that mimics the way the designer decides, based on the observation of the designer’s reaction over a small-scale GIS learning object selection problem.

M. Baldoni et al (2006) In this work they have shown the integration of a new semantic personalization web service for course planning within the Personal Reader Framework. The goal of personalization is to create sequences of courses that fit the specific context and learning goal of individual students.

Mariko Sasakura et al (2007) They propose a framework for adaptive e-learning systems and show a prototype system based on the framework. The system consists of two parts, the self-learning part and the authoring part. The prototype system consists of two parts:

- Self-learning part: it is based on the model represented
- Authoring part: it is for making materials and exercises.

A student uses this part.

This part is used by teachers.

Alex Pongpech et al [2007] They illustrated a manner that their proposed representation can be utilized for personalized learning functionality such as courses recommendation functionality. Although they use background of each learner to recommend suitable personalized goal, they also have observed that in several instances the minimum number courses left uncompleted might not be enough to provide a unique solution for each learner. Furthermore, given that there can be more than one possible recommendation for each learner, thus mechanism for allowing learners to specified personal criteria to find a possible unique solution would more superior.

Owen Conlan et al (2007) In This paper they have described the principles behind the combination of personalized content and services may be used to create activity-based personalized distance learning offerings. Through combining the methodologies seen in the domains of service composition and personalized learning a service-oriented approach to personalized learning activities may be realized. They show the principles of the multi-model, metadata driven approach as appropriate guidelines for achieving successful personalizations that engage learners in activity-based distance learning opportunities.

**Personalization**

The concept of personalization as an organizing principle for innovation in higher education, suggests that ultimately the individual learner can and should be the center of everywhere infrastructure of support (Friedrichs & Gibson, 2001). Designers of new network-based applications are envisioning a day when the technological infrastructure for personalization is invisible, always available, accessible in many formats and personal devices. Innovators in higher education can now develop and use network-based applications that support personal inquiry, decision-making, action planning, documentation, mentoring and validation of work as well as evidence of learning. A new eLearning and web application is designed to
facilitate personalization to enable personalization of education while at the same time meet the accountability needs of higher education. Personalized content access intends to improve an information retrieval process by adding explicit user requests to implicit user preferences. This is likely better meet individual user needs and its overall satisfaction regarding the system outputs. Such request reformulations also disambiguates initial queries. Personalized user interactions can be done according to different steps:

1. Modeling the user profile.
2. Acquiring user's data.
3. Generating personalized services

In the last decade several basic principles of the learning theory have been reevaluated having in view the new facilities of the Information and Communication Technology (ICT) evolution, as well as by some lack of success of the existing eLearning systems. New computational environment are necessary in order to support new framework for education such as integration of working and learning, self direct learning. The fulfillment of individuals of each user – learning personalization needs, the learning personalization need new solutions for a many of aspects as:

1. Adapting to the profile, goals.
2. Knowledge formulization.
3. Learner objective definitions.
4. Learner knowledge acquired opinion.

The simplest user model is the overlay model, wherein the user’s knowledge is a subset of the system’s knowledge. In its simplest form the overlay model states if an item of the knowledge base is learned, it is not completely learned or is unknown. By comparing the user’s knowledge with the expert’s knowledge the system derives the user’s lack of knowledge. The critical part of overlay modeling is to find the initial knowledge estimation. One of the main drawbacks of this approach is that it can’t model the user’s misconceptions of knowledge concepts, which is an important aspect within learning environments. More elaborated versions of overlay user models can differentiate between more detailed knowledge states.

Learning Styles

There are two major categories of learners, who respond better to what they see are visual learners and those who respond better to what
they hear are auditory learners. Broken down further, people learn by:

1. Reading (visual).
2. Listening (auditory).
3. Seeing (visual).
4. Speaking (auditory).
5. Doing (tactile)

There are also the tactile learners, they learn by doing. But when faced with new information, the majority of them fall back on their dominant learning style.

- An auditory person would say, “Just tell me!”
- A kinesthetic individual would say, “Let me do it!”
- A visual person would say, “Let me see it!”

There are several inventories where by answering questions a person is provided with his or her preferred learning style, learning styles can be addressed in both traditional and virtual classrooms.

**Learner Information**

Learner information is a collection of information about a learner. The objective of these specifications is to allow the important data into and extraction of data from different systems. They provide data models, including the syntax and the semantics, to describe both the characteristics of a learner and his or her knowledge/abilities.

The information is associated with learners and used by Learner Information servers that may exchange data with learner delivery systems or with other servers. It is the responsibility of the learner information server to allow the owner of the learner information to define the information to be stored and shared.

Basically, information about a learner comes from three different sources:

1. Personal information
2. Preferences
3. Academic information

In the following section we present various contributions to complete some standards and specifications about learner information, especially those related to learner's preferences, because it is in these preferences where specific characteristics of learning through mobile devices are reflected.

**Learner Profile and Device Profile**

Inside the Learner Profile, a new type of structure, called Device/Devices Profile, will be created. The Device Profile addresses the characteristics of the device used by the learner for learning tasks. More specifically, the Device Profile stores a set of preferences about managing the device related to its particular characteristics. These preferences will be processed as "default preferences", which, if it is possible, will be finally used. To consider those cases in which these preferences can't be satisfied, some ranges of variation about them are defined. Obviously, these ranges must be supported by the considered device [19].

Ultimately, for facilitating the task of fully supporting the experience of learning according to conditions solicited from the learner, a set of values will be included that indicate the maximum capabilities supported by the device related to its characteristics (e.g., related to speed and types of connection, display capacity, etc.), and always carrying out the user's preferences. Furthermore, a learner can be in possession of several devices for use in learning; because of this, the learner must be able to complete his/her learning through all of them. Depending on his/her situation at the moment, he/she can select, from among all his/her devices, the one that is more convenient at that moment to achieve the learning tasks that he/she wants to complete. In such a case there will be not one Device Profile, but as many Device Profiles
as the learner has "learning devices" to be used at his/her convenience. Therefore, three possible forms to implement the above exist:

1. To include all the Device Profiles inside the same Learner Profile, which implies the system must be able to interact with each of the different Device Profiles within a single Learner Profile.

2. To permit only one Device Profile per Learner Profile, this implies the existence of several Learner Profiles (at least one per Device Profile) with which the system must be able to interact.

3. To permit both previous schemas, i.e., to permit several Learner Profiles (or only one), which can include one or more Device Profiles.

All of this implies the need for researching a set of services to manage all gathered information related to mobile devices. These services must be complete with a series of behavioral models that define how the data will be managed.

In order to define the learner profile we focused on the IEEE Public and Private Information (PAPI) for Learners (PAPI Learner) [21]. It specifies the semantics and syntax of learner information defines and/or references elements for recording and viewing descriptive information about learners from different perspectives (learner, teacher, parent, school, employer, etc.) [22].

According to information types defined in PAPI, we proposed a profile ontology [23] combining four information categories:

1. Learner general knowledge:
   This category combines personal and general information about the learner (identification, function, domain, level, performance, etc.).

2. Learner knowledge level:
   Corresponding to the subjects to be learned each learner situated in a given knowledge level (beginner, medium, confirmed) has to set his targeted knowledge level (beginner, medium, confirmed, expert). To express this knowledge level the following levels are noted:
   a. Beginner
   b. Medium
   c. Confirmed
   d. Expert

3. Learner learning styles and preferences:
   The preferences describe the course concepts structure which is defined by cognitive preferences (introduction, reminders, exercises, etc.) and learning styles (physical support) preferences (videos, images, etc.). The learning styles
are described by a set of physical items like:

a. Text  
b. Voice  
c. Video  
d. Picture, etc.

The cognitive preferences are described by an ordering of cognitive items. An ordering example of cognitive items can be as follows:

a. Introduction.  
b. Reminder  
c. Theoretical Survey  
d. Exercise  
e. Summary

Learning Interest

The learning interest is depend in the learner interest which is mainly stored in the learner profile, learner interest is which courses/materials he/she like to study online (Java, C++, Math ....etc)

Learning Devices

Today learner can access online courses from anywhere and anytime with his suitable device at high right moment (laptop, PC, mobile device.... etc.)

Learner’s Context Components

The learner context can be described by a great set of facets. However, the learner interacts with systems in many roles and is concerned in different tasks in parallel, each of which is related with a specific subset of the user context facets. To reflect this structuring the learner context is divided into multiple working contexts (see Fig.1) combination together learner context facets that are related to and relevant for the same task and/or role of the learner.

Fig.1: learner's context component
Learner Profile
This category captures all the common information that can compose a user profile.

Device Context
Terminal type used by the user while browsing the portal. The device used can be a laptop, a PC, a PDA, etc. This category is necessary in order to graphically adapt the interface according to the dimensions and graphical settings of the terminal.

Spatial Context
This facet refers to the physical location of the user and to the time frame.

Learner History
Old Task + Old Browsing + Old Selection
Old Task describes the reason why the user came to this subject in the past i.e. the purpose of his old navigation. Old Browsing points to what the user did in order to get answers to his queries whereas the Old Selection designs the chosen items. The User History helps to keep track of completed browsing of the user including links, items and selections he/she did.

Current Behavior
Current Task + Current Navigation.
Current Task describes the task the user is currently involved in, whereas the Current Navigation points to a history of tasks completed so far within the current working context.

The context model proposed here is defined as an extension of the generic ontology user defined in [25], [26] and including/understanding various characteristics of a user, containing concepts, under concepts and relations between the various concepts.

Basic Workflow of the Personalization System
In this section, we describe how the abovementioned model is incorporated in the work and we describe issues assisting the reader in understanding how the proposed context model affects the browsing procedure. The main functionalities of the system (fig.1) can be summarized in the following steps:

1. Creation of a User profile: it associates the user with one category of users that are most close to his type of knowledge. It is important in this module to make an evolutionary and not static detection of profile. Thus, this module contains the acquisition and observation functionalities in order to manage the user actions in the whole interaction. When new information about the user can be conditional, this module updates the user profile by adding the new information. The latter sends to the recommendation module the portion of user profile with the new preferences about the requested service.

2. Invocation of the tracing services when a user starts browsing on the considered web site.

3. Request extension: this is based on the User Profile and the Current Task in order to extend the user's query according to preferences indicated in his profile even if the user does not demand. For example, Mr. F formulates a query asking for a subject in C++ whereas it is indicated somewhere in his profile that he prefers a specific learning style like (vice, txt,…etc). The purpose is to be able to add to his query the indicator even if Mr. F doesn’t ask for it explicitly.

4. Item recommendation: this functionality is specialized in providing information about subject of interest. It provides the types of
available request and other features useful to better select them for the user.

5. Interface adaptation: with the new technologies, it is possible to create dynamic and very representative interfaces on the web, an environment able to provide facilities for both browsing and displaying results. The objective is to present to the user an intuitive visual interface that may significantly reduce his cognitive load when doing a search on the web. Visualization is a promising technique that enables people to use a natural tool of observation and processing (their eyes as well as their brain) to extract knowledge more efficiently. Thus, the interface adaptation services intend to reconfigure the graphical design according to user's profiles and browsing ways.

**Algorithms Flow**

In the proposed system, the recommendation of items or destinations is strongly related to the user’s profile determined in the data-filtering process. Once the data relating to the users are collected (implicitly or explicitly or even in both ways), appropriate content is determined and delivered. This process is followed by information Web usage filtering techniques as follows:

1. The system tracks user behaviors preferences and recommends items that are similar to items chosen in the past. For example, if a user shows an interest in C++ or JAVA, or by a particular subject, links to other related items will be presented.

2. We specify rules based on static or dynamic profiles that are then used to affect the content served to a particular user. For example, association rules could explicitly encode the fact that users who choose to x and then y may also be likely to be interested in z subject.

3. Web usage mining which relies on the application of statistical and data-mining methods to the Web server log data is then used in order to find a set of useful patterns that indicate users' navigational behaviors. Statistical analysis methods are applied to Web data to extract statistical information such as site activity, diagnostic, server, referrers and click stream analysis.

The focused in this work is on the modeling aspects and don’t want to go into further details concerning the reasoning features.

**Prototype of the Proposed System**

The students will log on to the system and are presented with the questionnaire designed using JavaScript. Once completed the results are stored in the database. The students are then presented with a pre-test. The results of this are also stored in the database. The students are then presented with the module content that with include three topics that are designed to suit each of the learning styles. JSP/HTML pages will be used to navigate through the site and present results to the student and link between each section .after they have completed the module materials they must complete the post-tests. these results are stored in the database .pre-tests ,module content and post-tests are presented to the student using draft embedded in system .the following diagram displays the design of the experiment .All member of the group are tested on all topics which is designed to suit their learning style . All of the students are measured on their success in all topics and results are compared.

**Steps Follow**

**Step1:** Web site main page

**Step2:** If New Member then
Step 2.1: Registration (Get Profile information)
Step 2.2: Confirm success of registration
Else
Step 3: Get account information
Step 4: Check profile
Step 5: Call Database optimizer search algorithm
Step 6: Display material list

Step 7: Call Database optimizer search algorithm
Step 8: Get device Basic information
Step 9: Display material style
Step 10: Advice for material style suitable for device
Step 11: Enable download
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Transition to e-Learning in a Gulf Arab Country

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Abstract
In e-learning, students need to develop new skills and modify behaviours that were successful in a traditional face-to-face environment. This research study utilized a qualitative approach to examine Qatari students’ experiences in a pilot eSchoolbag project, which combines face-to-face instruction with e-learning resources and strategies. The experiences were reported by the students themselves, within the context of their cultural and educational environment. This study used an open-ended pen-and-paper survey and semi-structured small-group interviews with 12 students who represented a range of experience and ability in the use of computers and the English language, though all used Arabic for communication at home. Participants’ experiences reflected elements of online communities of inquiry, with some variations due to this particular group’s age and blended rather than wholly online learning context. Educational values, English-language ability, and experience with computers emerged as structural issues that affected students’ e-learning experience. Three essential elements of the experience for this particular group of students were found to be motivation, belonging, and adjustment. The results of the study add to the body of knowledge about the experience and needs of school-aged Arab students in e-learning.

Introduction
The advent of new technologies that facilitate communication and information-sharing worldwide have had a marked effect on distance education (DE). Technology-based initiatives are being implemented around the world as a means of improving quality and expanding access to education for previously underserved sectors of the population. With this implementation, however, it has become apparent that, to be successful in a technologically mediated learning environment, students need to develop new skills and modify behaviours that were successful in a traditional face-to-face classroom (Cleveland-Innes, Garrison, & Kinsel, 2007). As research and experience expand, distance educators become more aware of the need to design programs that respond to the specific needs of learners of diverse regions and cultures. On every continent one can find initiatives to develop appropriate delivery methods, curricula, resources, and support that utilize new technologies to improve education quality and effectiveness and to address the particular needs of local learners (Hedberg & Ping, 2004; Kumar, 1999; Kanwar, 1999).

The countries of the Gulf Cooperation Council (GCC) have developed extensive plans for modernization in recent years. Infrastructure, health care, and education have been targeted for expansion and improvement in order to prepare citizens for economic growth and development. In the State of Qatar, the government has embarked on an ambitious plan for reform of the school system, including government funded Independent Schools to promote innovation,
and assessment based on international standards (Supreme Education Council, 2006). In higher education, initiatives include the restructuring of Qatar University, and the development of Education City, a 2,500-acre campus on the outskirts of Doha which hosts branch campuses of several North American universities as well as numerous other educational and research institutions (Zoepf, 2005).

Although distance education policy has been noticeably absent in Qatar in the past, recent initiatives at the institutional and government levels indicate a growing acceptance of the principles of e-learning. At Weill Cornell Medical College in Education City, for example, students receive some of their lectures via videoconference from the main campus in New York, while the website of Carnegie Mellon University in Qatar offers access to the Blackboard Learning System. In the K-12 sector, grade 7 students at Al Wakrah Independent Girls’ School received e-Schoolbags containing Tablet PCs as part of a pilot project intended to develop technical and intellectual knowledge and skills and to converge in-school and at-home learning activities (Supreme Education Council, 2006). The Tablet PCs allow note taking, sharing and editing of information electronically, and contain e-contents on Science, Math, and English. Teachers use pre-prepared course materials aligned with Qatari curriculum standards as well as their own customized materials to fit their students’ needs. They present material, supervise, and support students in a face-to-face classroom situation, while students use the electronic medium to complete assignments and tests, carry out further research, communicate with the teacher, and access resources on the Knowledge Net (Knet) portal from home or school. The e-Schoolbag program, along with the Knet are initiatives of ictQatar, an organization established by His Highness the Emir Sheikh Hamad Bin Khalifa Al-Thani, to accelerate the transformation of Qatar into an information-based society (ictQatar, 2007). In a nation that until recently offered only teacher-centred classrooms that emphasized rote learning, this illustrates a marked change in educational approach.

Government and educators in Qatar face a challenge in that very little research has been done into culturally-specific needs of Arab e-learners, and the authors could find none that referred specifically to Qatar. Al-Harthi (2005) cites various authors in Moore and Anderson’s Handbook of Distance Education who highlight the lack of research studies focusing on the cultural aspect of distance education to provide practical guidelines for global courses and greater understanding about cross-cultural differences that influence online learners. In addition, the bulk of worldwide research in online learning has been carried out on adults in professional and higher education contexts, who experience different opportunities and challenges from K-12 level learners. Traditional models of western-based adult distance education assume a mature, independent learner, exhibiting individualism and low uncertainty avoidance as described by Hofstede (2001). Cavanaugh, Gillan, Kromrey, Hess, and Blomeyer (2004) highlight autonomy and internal locus of control as two criteria of successful distance learners of any age and recommend carefully considered scaffolding approaches in order to support younger learners who have not yet developed these characteristics fully. The requirement of younger students for structures and approaches that enhance motivation and metacognitive development creates a need for research specific to this age group. If Qatar and other GCC nations are to formulate policy that will address the particular characteristics and needs of such learners, they require a body of research that explores and explicates the experiences of these learners in their own context, rather than rely on research and
information from other states that do not share their cultural and developmental heritage. The purpose of this study was to explore the experience of grade eight students of Al Wakrah Girls’ Independent Preparatory School in Qatar participating for the second year in a pilot eSchoolbag project, and to suggest approaches to enhance their motivation and achievement in the program. By adding to the body of knowledge that examines culturally determined learner experiences with DE methods and technology, this study can provide valuable information for those charged with developing e-learning and distance education courses and programs for global distribution and for Arab and adolescent segments of local populations.

The theoretical framework for the research was eclectic, drawing on literature about cultural differences, education for development, education among Gulf Arabs, and online learning. Due to the exploratory nature of the research with this particular cultural group, the researcher focused on current literature that addresses these issues to provide a background to the questions under study.

Cultural Differences

Hofstede & Hofstede define culture as

“a collective programming of the mind that distinguishes members of one human group from another” (2005: 21).

They identify various levels of culture: national, regional/ethnic/religious, gender, generation, social class, and organizational. They highlight the need for an understanding of how people from diverse cultures actually differ in their “collective programming.” The sum of Hofstede’s research comprises the cultural characteristics of 53 countries and three regions (ITIM International, n.d.). Unfortunately, his data for Arab-speaking nations combines values from the countries of Egypt, Iraq, Kuwait, Lebanon, Libya, Saudi Arabia, and the United Arab Emirates, which, though sharing a common language and the Muslim faith, differ in their history, geography and social structure. As such, Hofstede’s cultural dimension values cannot be seen to be an exact depiction of Qatari culture, but serve to provide a broad description of values identified in Arabic-speaking Islamic cultures, of which Qataris are a part. Hofstede (2001) identified four dimensions that differentiate members of cultural groups throughout the world and thus influence what constitute effective and acceptable actions and interactions. He labeled these dimensions as follows:

1. Power Distance illustrates social equality and class differences;
2. Individualism/Collectivism reflects the ties between individuals and the strength and role of groups within the society;
3. Uncertainty Avoidance indicates the extent to which people feel threatened by and avoid ambiguous circumstances;
4. Masculinity/Femininity contrasts dominant values of material success and self-centredness against interdependence and service

He later identified a fifth dimension, Long-Term Orientation, which has not yet been scientifically applied to Arab-speaking cultures, thus will not be considered in this study.

Woodrow (2001) argues that the underlying value systems embedded in ways in which societies view the nature of learning makes international exchange and social equity in education problematic. He indicates that different valuations of cultural capital create differential power in education, and that culturally derived assumptions about autonomy and authority dominate decision-making on school curricula around the world.
**Distance Education in Developing Nations**

Some failures of distance education in developing countries are a result of differences in learner characteristics, study habits, attitudes, and academic self-concept between the cultures of course developers and those of learners (Kumar, 1999). A number of studies have documented the effects of cultural factors on motivation, presence, and communication in online courses (Gunawardena, Wilson, & Nolla, 2003; Inglehart & Baker, 2000; Woodrow, 2001). Much of this research has been limited to overseas students being taught in an unfamiliar culture or online by teachers with unfamiliar pedagogical strategies, but it highlights the need to understand how students adapt to distance and online delivery methods in order to make courses both culturally and pedagogically relevant (Selinger 2004). Baggaley and Hoon (2005) describe the innovative use of learning technologies not currently considered in North America and Europe as a means of addressing the learning and infrastructure needs of learners in various Asian countries, thus illustrating that the direction of input and innovation need not always be from developed nations towards developing ones. Gulati (2008) provides a comprehensive review of successes and challenges of technologically enhanced learning in developing nations, in Africa, Latin America, and Asia.

In discussing problems and solutions for DE in developing countries in Asia, Ramanujam (2001) cautions that DE development depends on appropriate responses to specific needs of learners, not mere imitation of Western models. He recommends evaluation of existing teaching and support practices and the potential of ICTs along with institutional review in the development of appropriate policies for DE. Hedberg and Ping (2004) describe approaches adopted by Asian schools to address this issue and suggest a more integrated view of e-learning for administrators, that focuses on design that elicits engagement, including authenticity, on-demand learning, and assessment approaches, and on support and resources, such as knowledge management, digital libraries, learning objects, communities of practice, and emerging technologies.

**Education in the Gulf States**

The GCC contains some of the fastest growing populations and economies in the world. However, currently, expatriate workers make up 70% of the labour force. If these nations are to achieve their economic and social goals, there is a need to produce a modern, highly trained and motivated industrial workforce while maintaining traditional Muslim values (Kapiszewski, 2000). Bahgat (1999) argues that the quality of education currently does not correspond to the needs of Gulf societies. He indicates that, whereas most developing nations struggle to find the financial means to achieve their education and development goals, Gulf countries boast a surplus of capital, yet deficiencies in their education systems remain due to:

- a mismatch between a traditional education system which yields educated but unemployed workers who then depend on the welfare state, and the needs of a modern, technological and scientific society;
- an imbalance between the indigenous and the expatriate labour force, as the local labour force lacks technological and management skills to lead development;
- a gap between the roles of men and women, wherein women's principal role as wives and mothers and cultural norms that dictate physical separation from men preclude them from taking an active role in the workforce
Research from diverse areas throughout the Gulf illustrates efforts to address these deficiencies, especially in the realm of gender issues (Beatty, 1996; Al Kharafi, 2003), with varying degrees of success.

**Arab Learners**

Research specific to the experiences of Gulf Arab learners in distance education is almost non-existent in the literature. Shaker (2000) surveyed universities offering courses and programs at a distance in Bahrain and studied reasons Bahraini students gave for their choice to study at a distance. Al-Harthi (2005) studied the experiences of Arab graduate students who were required to pursue a portion of their degree programs in the United States via online courses. She cites Hofstede’s international cultural dimensions and Hall’s high and low-context culture as frameworks to explain

- lower social pressure of electronic communication, which was liberating for some learners, but resulted in procrastination and even non-participation by others;
- contrast between the high context messages used by collective cultures such as the Arab students, and the low-context communication of individualistic cultures, which characterizes electronic communication;
- lower levels of participation in online communication among the Arab students, who focus more on the product of learning rather than the process;
- avoidance of confrontation with instructors when problems arose

She found that graduate Gulf Arab students reported an aversion to the isolation and independence of North American distance education courses. She infers that this may be due to social and cultural traits apparent in Gulf Arab society and reflected in traditional role expectations of learners. She reflects that results might differ if this study was repeated with Arab students studying at a distance in their home countries where they are immersed in a culturally relevant environment. Although such studies hint at experiences specific to Arab students and the support mechanisms that might address these, to date there has been no published scholarly research which describes the experience of school-age Arab learners with e-learning and suggests suitable support initiatives to facilitate their transition.

**Community of Inquiry**

This model, originally proposed by Garrison, Anderson, and Archer (2000), provides a framework for the study of online learning. It emphasizes the importance of community in learning and identifies cognitive, social, and teaching presences as elements in the learning experience. Though developed from experience with higher education and online communities of adult learners, the framework is helpful in conceptualizing the learning experience of students involved in other forms of distance-based learning as well. The research also provided an opportunity to observe the applicability of the Community of Inquiry model in the context of K-12 blended learning, to which it had not yet been applied.

**Role Adjustment for Online Learners**

Cleveland-Innes, Garrison and Kinsel (2007) describe the process of role adjustment experienced by learners new to online study. They identify interaction, instructor role, self-identity, course design, and technology as themes that arose in relation to cognitive, social, and teaching presence in a study framed by Garrison, Anderson and Archer’s (2000) Community of Inquiry model. Although such research exists on students in a North American context, the author could find none to date on the experience of role
adjustment of e-learners and distance learners in developing nations, including Arab nations. Very little research addresses the current needs and realities of Gulf Arabs who, at this point in their development, with the economic means and the political will to adopt innovative policies and practices, would greatly benefit from research that addresses issues pertinent to their populations. In turn, the global community would benefit from further study of this little-studied sector of the world’s population, which, though small in terms of population, plays an increasing role in the social, political, and economic state of the world.

The Study

Qualitative Research Strategy

This study utilized a qualitative approach as described by Creswell (2003). The researcher examined students’ emotional and intellectual experiences, as reported by the students themselves, in the context of their cultural and educational environment. She analyzed these from the perspective of current theory on communities of inquiry and culture, in order to create an empathetic understanding of the students’ experience of e-learning (Neuman 2003). In order to accurately present the perspectives of participants and stakeholders in this study, her method included cultural deconstruction, appreciative inquiry, and non-judgmental openness to different perspectives that arise from the inclusion of multiple voices (Ardichvili & Kuchinke, 2002; Tenkasi & Mohrman, 1999). The intent was to describe the experience of a particular segment of the population in light of current theory, in order to broaden the general understanding of that experience for the group in question. It did not seek to explain or predict and the development or revision of theory was not a goal, due to the limited generalizability of the results.

The study was carried out in six phases to encompass the preparation of materials and instruments; administration of an open-ended pen-and-paper survey, analysis of survey responses, follow-up semi-structured interviews and analysis in an iterative fashion, a second round of interviews for validation of the findings, and the development of the final report. Participants were not given a definition of their role as learner. Instead, the researcher sought to elicit their experiences, both positive and negative, in relation to the cognitive, social, and teaching presence in their learning environment and their adaptation to it, with no theoretical or pedagogical suggestions as to the role of e-learner, in order to uncover the intuited experiences formulated by the participants (Giorgi, 1997). This approach was deemed useful due to the exploratory nature of the study into a little-studied population.

The researcher considered herself an instrument for data collection and analysis, with the potential to impact the final results. Giorgi (1997) highlights the need to maintain an open attitude in qualitative research in order to discover meanings in the data, allowing for the emergence of unexpected meanings. He recommends the intuition of relevant meanings through professional sensitivity and spontaneity, but also the bracketing of past knowledge about the object under study in order to allow the fullness of the situation to become apparent. Further, Neuman advises that,

“a researcher is in the field to learn, not to be an expert” (2003: 379).

The researcher in this study had no previous experience with the eSchoolbag project, and is not currently involved in any aspect of education in Qatar. Although she has several years of experience as a teacher at the grade level being studied and as a student in distance learning, she strived to adopt a point of view of “strangeness.” In this case, the researcher played down any experience and expertise in teaching and learning, face-to-
face or at a distance, and attempted to draw out the participants’ own knowledge and experience, by identifying herself as a student rather than a teacher and by continually asking questions and seeking clarification rather than providing opinions, comments, or examples.

The cross-cultural nature of this study required particular sensitivity on the part of the researcher. One enabling factor was the fact that, as a female, the researcher had access to students and teachers at the girls’ school. Traditions and mores of Islamic society would preclude the possibility of a male researcher completing this study. Despite such cultural segregation, it had been the researcher’s personal experience that once inside such all-female institutions, one generally finds the members very forthcoming and honest about their experiences and opinions. Even so, as an expatriate, the researcher needed to remain aware of self-presentation during all phases of the study, to a greater degree than would be true in the West, as, to some extent, the researcher herself was being “researched” by the participants who have not necessarily had ample contact with Western women and were themselves very curious. The researcher dressed and comported herself in a manner accepted and expected in Qatari institutions in order to play down cultural differences and focus on the objectives of the study.

In order to fulfill her role, the researcher was required to accomplish several tasks:

Prior to commencing the research:

1. Perform a self-assessment of underlying concepts, theories, and attitudes about the topic, the participants, and the study as a whole, in order to bracket these and assume an uncritical approach that would enable data collection with no judgment, interpretation, or conflict of knowledge claims.

2. Secure the assistance of an objective, culturally and linguistically qualified person to advise on cultural issues and to translate.

3. Review local norms of behaviour in personal and professional interaction, such as appropriate manner of address, common Arabic greetings and expressions, and behaviours related to hospitality, in order to enhance connections with participants.

During the research:

4. Dress, speak, and behave in a manner that reflects respect for the local norms and puts participants at ease.

5. Communicate respect and recognition for the particular needs of the participants, as it is not uncommon for Qatari people to view Western “experts” as forcing their own solutions on local problems.

6. Observe and listen objectively to the views presented, commenting and questioning only to encourage and to seek clarification.

During data analysis:

7. Identify all concepts and themes that arose from participants’ statements and report these non-judgmentally.

8. Identify structural elements that pertained to the students’ experience.

9. When interpreting findings, “unbracket” previous knowledge and intuition in order to draw on all possible data and experience.

10. In interpreting the themes that arose, consider the role of her own words, attitude, and behaviours and those of the translator on the data collected.

Data Collection

High quality data in qualitative research is the result of subjective interpretation of experiences by participants within a social
context, capturing interactions and interpretations that provide an understanding of the participants’ viewpoints (Neuman, 2003). In order to obtain such data, this study consisted of six phases. The first two phases dealt with initial data collection using the survey instrument. The remaining four phases were less defined as the collection and analysis of data became iterative in the interview phase. These are described in the sections that follow.

**Phase One**

This entailed the preparation of materials and instruments required in consideration of the participants and context. Instruments included:

- A letter introducing the study and seeking permission from the head administrator at the school in order to access the students and carry out the.
- A semi-structured interview plan that enabled the researcher to clarify and build on the themes that arose from survey responses.

**Phase Two**

Permission was obtained from the head administrator of the school to access the students, on condition that the parent and student permission forms and the surveys are completed at home to minimize class time required. The researcher introduced herself to the teachers responsible for the participant group. She outlined the purpose of the study and its methods, and answered any questions that arose. The teachers distributed the surveys to eligible students, providing background information and answering student questions in English or Arabic as required. Students were invited to complete the surveys in English or Arabic to allow greatest comfort and convenience of expression on their part. The teachers collected completed surveys in the week that followed, and returned these to the researcher.

**Data Analysis**

**Phase Three**

Survey responses were translated into English as required. All responses were then analyzed according to the psychological approach espoused by Moustakas (1994). They were read in their entirety to identify general themes, then reread more thoroughly and coded according to themes and sub-themes or concepts that arose. Student responses were compared within the context of responses within each survey, as well as across all the surveys in relation to the components of the Community of Inquiry model (Garrison, 2006). Themes and sub-themes were re-
ordered and grouped according to patterns that emerged. In recording codes, the participants' original voices were maintained through the use of direct quotations from the surveys. As recommended by Barrit, et al (1983), disagreements were not ignored, but rather noted as part of the procedure, reminding us of the diversity of experiences between individuals. Once all survey data had been analyzed, interview questions were revised and augmented to clarify or expand on themes that had been identified.

**Phase Four**

Interviews of one half hour to forty minutes were conducted at the school, which is neutral and familiar ground for the participants, with nine of the original twelve students, who had agreed to be interviewed. Three students attended each interview in order to make the experience more comfortable for the girls. The researcher introduced herself and her assistant and explained the nature and purpose of the interview, emphasizing the fact that this was not an evaluation of the students or the program and that they should feel comfortable answering honestly, as no one but the researchers would have access to their comments. Permission was obtained to audio record the interviews to facilitate a more natural flow of conversation and to maintain the participants’ authentic voices, expression, and terminology. Interview questions were broad and open-ended to allow for individual expression as well as discussion among participants to clarify and expound on each other’s ideas. Participants were encouraged to give concrete, detailed descriptions and examples from their own experience. New themes that arose from each interview were noted and considered alongside survey themes in subsequent interviews to further develop the thematic structure. Once all interviews had been completed, they were transcribed and all data was reread and compiled according to themes identified from the surveys, with modifications as necessitated by new themes that arose from the interviews, in a spiral manner of analysis.

**Phase Five**

A preliminary report was drafted by rearranging diverse responses and deleting the researcher’s voice in order to create a narrative from the point of view of the participants. This report was structured according to the overarching themes and supporting concepts that had arisen from the data.

**Validation**

**Phase Six**

A second round of interviews was conducted to share the preliminary report and seek validation from the participants on the findings. In qualitative research, replicability is not a criterion for validity, as it is very difficult to replicate conditions exactly. Rather, it is credibility, that participants recognize and understand the researcher’s description as accurately reflecting their experiences that indicates a sound qualitative study. Discrepancies that arose due to different participant perspectives in this study were addressed by seeking validation from the range of participants, including those who responded to the surveys and interviews in English or Arabic, and those who reported different degrees of family use of computers in the home, and triangulating the responses. The results of these interviews were integrated with the substance of the preliminary report to ensure that reported findings accurately describe the experiences of the participants rather than the interpretations of the researcher. According to Neuman, reliability in qualitative research results from internal consistency, that is, whether data is plausible given all that is known about an event, whether pieces fit together into a coherent picture. The second
round of interviews served to ensure that this was so in this study.
A final issue with regard to data quality and reliability of results was the credibility of the members. Neuman (2003) advises considering whether participants have reason to or are motivated to misrepresent or alter their experiences in their reports, and Grover (2004) cautions about power issues involved in research with children. These issues were addressed in this study by maintaining neutral, open-ended questions, word choice, and physical expression on the part of the researcher to avoid leading participants in their responses. Participants were reminded before each interview that the purpose of the study was not to evaluate them, their school, or the e-learning program, but rather to understand what it was like to be a student in e-learning in Qatar. There was no judgment or evaluation of participant responses during interviews, and the separation of students, parents, and staff, as well as the assurance of confidentiality, aided in encouraging complete and honest responses. Students were also free to discuss questions among themselves during the interviews and responded jointly to some questions, but voiced disagreement on other aspects of the e-learning experience.

Ethical Issues
The relationship between the researcher and participants involved issues of power and trust, especially since the participants in this case were of a young age and in the school environment. The researcher recognized it as a responsibility and priority to protect their interests. She obtained written permission from the school administrator, parents, and students themselves to distribute surveys, conduct audio-recorded interviews, and conduct validation interviews. Every effort was made to ensure participant comfort and confidence and to avoid psychological stress and anxiety. Students were reminded at each point of contact that participation was voluntary and confidential, and that they were free to opt out of the study at any point.

Results
In the Student’s voice
A total of 12 students agreed to participate in the study. Though all used Arabic for communication at home, seven chose to respond to the survey in Arabic, and five in English. Among those who responded in Arabic, there was a disparity in amount and purpose of parental use of computers and in the amount of time they themselves spent on computers for personal and academic purposes, ranging from none to five hours per day. Three reported no parental or personal use of computers outside of the eSchoolbag program. These students participated in the interviews with the help of the translator. Five students chose to respond to the survey in English. All of these reported that their parents use computers at home and all reported using computers themselves, both for the eSchoolbag project and for personal enjoyment and communication. All reported using computers for three to five hours a day, except one who chose not to be interviewed, who reported using it for seven to eight hours per day. Outside of school, computers were used mainly for chatting on MSN or listening to music, with email being a distant third use.
As the survey and the interview data represent different “layers” of participant responses to open-ended questions related to aspects of the Community of Inquiry model and role adjustment, the data from both instruments was compiled during analysis into one comprehensive description. Participants’ experiences reflected themes identified for online communities of inquiry, with a few variations due to this particular group’s age and blended rather than wholly online learning context. It was deemed important to maintain the participants’ original voices
where possible as these present the most accurate description of their conscious experience and diminish the role of the researcher’s interpretation of the data, especially in a study such as this, where the students’ age and cultural background were significantly different from those of the researcher. Grover (2004), for example, cautions that children are especially vulnerable to the representations that others impose on them. Textual description serves to communicate occurrences as closely as possible to how the students actually experienced them.

Cognitive Presence
This element recognizes triggering, exploration, integration, and resolution themes in the learning process.

Triggering. Students showed diversity in their descriptions of how well they understood what was expected of them in their coursework. This diversity was recognized by one of the students when describing her experience with the e-schoolbag program: “Some people likes laptop, some people hate the laptop. Not all the class. They are different.” Due to the age of the students, enjoyment and interest were important factors in their willingness to use the technology for learning. Two qualities that students appreciated in the course material were “fun” and comprehensiveness. The nature of “fun” was not agreed upon by all the students, as, while one student enjoyed the games in her courses, another found content-related games uninteresting. When asked who was responsible for their learning, student’s responses were again diverse, referring to teachers, parents, the program website, and themselves. Students recalled approaching teachers with their questions and concerns. Some expressed appreciation for the power to track their own progress by accessing their marks promptly after they had submitted assignments. When faced with challenges presented by the technology, students showed initiative. One recalled proudly that she put stickers on her keyboard to help her remember the placement of the Arabic characters. At times, however, they felt uncomfortable with such challenges, as evidenced by one student who described a particular situation in which she had felt frustrated when she did not find the required software for a lesson.

Exploration. To date, only English, Math, and Science content have been presented via the e-Schoolbag at the school. For Social Studies, Arabic, and Islam, students use the laptops only to write up assignments. They described various experiences with course material that reflected the nature of each core subject and the structure of the e-learning program used. Language of instruction was a relevant issue as none of the students at the school have English as their first language but all course material done on the laptops is in English, as this is a requirement for core subjects of Independent Schools in Qatar. This presented a problem for some in Science, where they found it challenging to learn English terms. Not all students had difficulty with this, however. Throughout the surveys and interviews, it was apparent that those students who displayed greater ability and confidence with the English language were more positive and self-directed about e-learning.

A feature of the Science program that students chose to discuss was the presentation of experiments via e-learning as compared to face-to-face. While some students enjoyed the convenience of having designs, videos, and results in their laptops, others preferred going to the lab and conducting hands-on experiments. When it was time to review, students preferred pen and paper to the screen. In Math, the students generally expressed satisfaction with their experience with the eSchoolbag. When asked if it was
easier or more difficult to learn Math with the laptops, responses varied between easier and the same. They stated that design tools on the laptop made some aspects of Math easier. All indicated that their marks were higher in Math when working with the laptops. The only concern expressed about using the electronic tools for Math related to the long-term applicability of the learning, when students are faced with doing Math without the tools. One student argued that instead of having tools to make the tasks easier, the students should “focus and make it better and have an improvement” because the tools transfer control of the task away from the student.

In English class, students described a pragmatically designed course that combined teacher presentations on a “smart board” with student worksheets and homework on their laptops. Most were positive about this mixed approach, as it created a comprehensive unit on their laptops from which they could work. When asked about History, Geography, Arabic and Islam, which in the future will also be offered via e-learning, the students were neutral to optimistic: “Nothing will change. That is something that is very easy with the laptop or without the laptop,” and “It will be more interesting and have lots of information.”

Student’s survey responses as well as their comments and physical expressions during the interviews indicated a high level of self-assurance in their ability to achieve the objectives of the courses and assignments, especially among those girls who chose to respond to the survey and interview in English and those whose families use computers at home. Anxiety was expressed by one student who responded to the survey in Arabic and did not agree to participate in the interviews. Students explained that for the girls whose level of English was weaker, the content on the laptops could be very difficult.

Experience at home mirrored many of the issues faced in school. Students agreed that homework is not normally difficult, but indicated that homework difficulty varies according to the academic level of the students. They expressed different preferences for working on paper or the laptops depending on whether the homework consisted of the completion of assignments or studying for quizzes and exams. Benefits of using the laptops and Internet resources were recognized, especially the access to required resources in a manageable package on the laptop. Students identified family members and classmates as sources of homework assistance when required. Those whose families use computers for their own purposes in the home requested technical help from knowledgeable family members. For those students who did not have Internet access at home, however, these benefits did not enhance motivation. Rather, their workload was increased at school, as they had to complete requirements during their breaks.

Students named the technology as the greatest frustration and challenge to their ability to complete assignments, recalling the absence of necessary software or assignments on their laptops, and problems with connections within the classroom. Technology support was an important component of the program, as there was a wide discrepancy in computer skill experience among the students and their families. Some interview respondents described feeling knowledgeable about using the laptop, indicating that it was “easy” and that they “didn’t have any difficulty with it.” They related that they had received initial training from people outside the school, and later felt welcome to ask for help from the Program Manager or her assistant as required. Problems that required such assistance normally related to missing programs or files on the laptop or challenges with hardware, and were dealt with promptly.
An aspect of technology that seemed to cause concern was the network connection between the teacher and students, who recalled instances where “some girls didn’t, … receive the lesson. Didn’t take it. And some girls don’t have it.” One student laughed nervously as she described her own experience with a missing assignment. Another added that, “it wastes many times to connect and if the teacher wants to send us work….” She suggested lengthening the class period to allow time to transfer and complete the assignments, because sometimes, “The thing comes… not come….” When asked about the most frustrating aspect of e-learning, one interview group chorused, “The exams!” and went on to describe animatedly occasions where students attempted to send time-sensitive exams, and sometimes homework, to the teacher only to have it deleted or undelivered. Interestingly, while one group of interviewees was eager to discuss this problem, another group, when asked about problems with connecting to the teacher, responded that there were no problems. It might be of note that the two groups were from different classes. When questioned about this discrepancy, they indicated that the wireless connection in the school was not equally effective throughout the building, with some classrooms experiencing weak connections. They indicated that this problem was being addressed and each classroom would be provided with its own wireless router.

All interview groups agreed that an undesirable aspect of working on the laptops was the stylus that is provided. The students expressed preference for work that uses the keyboard, except when drawing, as this allowed them to be farther back from the screen, which they found easier on their eyes, and to complete work on their home computers if necessary. The keyboard on the laptops presented a further challenge. Normally, keyboards in Arabic countries have both Arabic and Western characters on them. The laptops used in the school have only the western characters, although the software allows Arabic characters. In order to complete assignments in Arabic, the students needed to memorize the location of the Arabic letters. Interestingly, although this problem was mentioned more than once, none of the students viewed this as a major obstacle to their adjustment.

Of apparent concern to the participants, as it was an issue that arose in response to several questions in the survey and interviews, was the perception of whether marks go up or down when they use the eSchoolbag as opposed to a traditional classroom approach. Some students’ confidence was tempered by a concern that marks drop when students work via e-learning, although this impression was not corroborated by the respondents’ own results.

When asked whether and from whom they access help when they require it, students displayed confidence in their ability to solve their own problems. They also recalled working alone as well as getting support from teachers, parents, siblings, and other students, and combinations of all of these. They recalled consulting the self-correcting programs, the Knet website, and their teachers in order to check their understanding of new material. Some described examples of their own initiatives to change evaluation results they felt were inappropriate. Group work also provided feedback for individuals, and all the participants indicated that they worked in groups on diverse activities both in school and at home. Regarding help from family members in e-learning as compared to traditional homework, the consensus was that there was no difference, although one student indicated that she received less help with her coursework for e-learning, as her mother did not like to work on the computer.

Integration. Some students valued the transferability of skills acquired through e-
learning. One student recalled (translation) “maintaining, how she fixed the computer problems, how to make it easier. She saw how to do it and she can do it herself.” When asked if she enjoyed fixing her computer, her reply was an enthusiastic affirmative: (translation) “She would like to be an engineer for ICT and computers.” Several agreed that, besides developing computer skills, e-learning made them better students in Math, Science, and/or English.

Resolution. In the Community of Inquiry model, the category of resolution is used to describe mastery of course content. Student responses indicated that their marks were not significantly different overall when they used the eSchoolbag as opposed to traditional learning. The students also viewed the knowledge, skills, and attitudes required to use the technology properly and responsibly as crucial elements to be mastered in the program. An issue often raised in the interviews was the relative benefit of working with the laptop versus paper. This was a salient issue with this group as, in many cases, they had the option to print assignments, complete them on paper, and submit them personally rather than complete them on the laptop and send them electronically to the teacher. While participants described “programs to play” in English, Science, and Math that were “fun, no worksheet,” several complained that “[writing on] worksheet [is] easy and the laptop …problem.” Therefore, given a choice, many opted to complete their assignments and review for exams on paper. Others were less particular and appreciated the choice offered by the access to both media.

Affective Expression. In school and at home, most students described feeling an integral part of the class group, although one, who participated in both the survey and the interview in Arabic, described her importance as “not much.” Some indicated that they felt welcome to participate, help each other and share ideas. This was not the case with all students, however, as one indicated she participated only “sometimes with certain students,” citing examples of particular and or tasks.

Open Communication. Students appreciated the opportunities for communication made possible by the technology, but described the conflict between their enjoyment of communication for social purposes as opposed to the school’s emphasis on communication for academic purposes. At school, they were able to connect only to the teacher from their laptops. When connected to the Internet, they could only access academic sites and the Knet, which included conferencing and email capabilities within the intranet. Some used MSN Messenger at home, though usually for social purposes only. They expressed a desire for an alternative chat site which would allow them to connect to classmates when outside of school. Some described the challenge in balancing social pursuits with academic responsibilities.

Group Cohesion. Several students emphasized group work. They reported helping others especially in the areas of technology and the English medium. Some students displayed discomfort in recalling instances when they felt left out of the group’s progress due to software or hardware problems. On asking for help from teachers and fellow students, students reported no anxiety: “I feel I want to learn more. I did not feel anything wrong. I feel welcome.” Some displayed a

Social Presence
This element describes the relationships within the group. It includes affective expression, open communication, and group cohesion.
high level of confidence in approaching the teacher and negotiating in order to achieve their aims. Although they could and did email teachers regarding homework, though, those who needed help with assignments while at home indicated their preference to call on friends in the same class. The students admitted that this assistance with homework was at times abused as students shared assignment answers on flash drives. When the researcher commented that this made homework very easy, the interviewees agreed with an uncomfortable giggle, but replied that this sharing of homework was not appropriate.

**Teaching Presence**

Teaching presence is apparent through the design, facilitation, and direct instruction in the learning experience. In the eSchoolbag pilot, teachers received training from courseware providers in the use of the hardware and software, and in pedagogy and skills for ICT in the classroom. Teaching, both direct and indirect, occurred through a variety of channels, including friends, family, and the school, as well as program design, resource availability, and limits on access.

**Design and Organization.** The students expressed satisfaction with the level of their teachers’ participation in the classes, though they indicated that this participation varied among teachers. Teachers’ main tasks included presenting lessons, helping students to use the technology, sending work to the students, supervising their use of the websites, and providing translation when required. In order to carry out these duties, the students indicated that teachers had received extensive professional development training during the past year. Teachers presented new material to the class as a group, using “smart board” technology. Despite the previously discussed preference for paper for revising, most students agreed that e-learning provided a greater variety of activities. They praised features that enhanced specific courses, such as the design tools for Math, English-language reference material, and Flash videos of experiments in Science. The multimedia nature of the presentations appealed to some students and games also provided motivation. While most students responded positively to this content-centred design, some students preferred traditional teacher-centred explanations and presentations.

Teachers provided extra help or translation to individual students as necessary. When asked if they worked together with the teacher more or less in e-learning, students agreed that there was more contact, although they reported disparity in the amount of help required by individual students to organize themselves. For technology support, the students turned to the Program Manager and her assistant. While visiting the school, the researcher often observed students approaching them with their questions and requirements.

Homework was individualized according to student ability, with the students being divided into “Standard” and “Advanced” levels. Students submitted completed assignments electronically to the teacher or the Knet site. These were marked and the marks made available to the students via the Knet website.

**Facilitating Discourse.** When asked about their mood or feelings in class, the students reported a range of emotions typical of a cross-section of middle school students, including “happy,” “excited,” “sometimes bored.” Negative feelings most commonly resulted from technology issues and different linguistic abilities in the English-medium content.

In all discussions about the role of the teachers, the students showed evidence of a comfortable relationship, where they were relaxed about asking questions, clarifying problems, and asking for help. Students
described the teacher’s role as facilitator, recognizing and exploiting positive learning opportunities within and beyond the course material. They were encouraged to solve their own problems, but felt comfortable asking for help if required. The comprehensiveness of the material available via e-learning enabled the students to work independently, accessing the teacher as a resource person for content-based questions, organizational assistance, and translation. They appreciated teachers’ flexibility and openness to negotiate answers, deadlines, and even the medium used to complete assignments.

Some students explained that e-learning presents new opportunities to monitor their academic progress, as with the laptop, they do a greater number and variety of activities that are evaluated, which enabled some of them to achieve better marks than in the traditional class where only major assignments and tests were marked. Students valued the immediate reinforcement of being able to check their own marks as soon as they were available.

**Direct Instruction.** After presenting a new concept, one of the teachers’ responsibilities was to ensure that students remained on task, avoiding distractions provided by friends or the technology. Students described the administration’s initiatives to address the lack of individual responsibility and self-motivation on the part of some students. One issue of great interest to the students, as evidenced by the amount and animated nature of discussion it generated, was the control of access to non-course-related material. While at school, students use the school’s network on which outside content is blocked. They can access only those websites related to their program. For those who are able to access outside material at home, the administration endeavors to maintain control of content and use of the laptops via surprise inspections of hard drives.

**Role Adjustment.** Cleveland-Innes, Garrison, and Kinsel (2007) identify interaction, instructor role, self-identity, course design, and technology as themes of role adjustment in relation to cognitive, social, and teaching presence. In describing their experiences with e-learning, many students in this study used a “then and now” dichotomy that is evidence of role adjustment. It must be noted, however, that the implementation of the eSchoolbag was intermittent. Students began the pilot project in grade seven, but at the beginning of grade eight found themselves back in a traditional classroom situation due to delays in the arrival and programming of laptops for grade eight content. This reduced the feeling of commitment to the approach on the part of some students, who preferred the familiarity of a teacher-led classroom to the greater independence and responsibility of e-learning. It also shortened the actual length of time the students had been using the laptops at the time of the surveys and interviews, reducing the opportunity for adjustment.

**Technology.** Students agreed that the greatest initial adjustment lay in learning to use the new tools. Some recognized a progression in their use of technology, both in skill and motivation. Some described how the initial novelty of the technology soon faded and left a need for motivating content and approaches. One student described marks as a strong motivator to learn and participate with the laptop.

**Teacher Role.** Several students recalled the support received from teachers, outside staff, and the e-learning program staff during the early stages of the program.

**Self-Identity.** Some students recognized the increase in their own responsibilities, both in learning and in using and maintaining the technology. One appreciated the increased control offered by her mastery of the tools
and skills of e-learning, as it allowed her to complete assignments on paper, the laptop, or her home computer, which she found very convenient.

**Course Design.** The combined face-to-face and e-learning format of their program allowed students to access as much or as little support as each required and to move along the continuum towards greater independence at their own rate. This aspect of the course design enabled it to address the needs of students of diverse academic, linguistic, and motivational backgrounds. Despite challenges, the students’ comments indicated an optimism that adjustment is still ongoing, on their part and on the part of the school, and that their concerns are being addressed by the staff and administration. When asked what it is like to be a student working with the laptop, one participant replied, (translation) “We are learning.”

**“In our school...”**: the eSchoolbag experience in context

Qatari culture is in the midst of a rapid transition. Due to ever-increasing revenues from oil and natural gas, consumerism, modernization, and technology have swept what was until recently a very traditional society. Although evidence of this modernization is visible throughout the country in building and infrastructure projects, shopping and sporting centers, and even in changes in traditional celebrations in Qatari households, essential values of Qatari people are slow to change. This supports Hofstede’s (2005) observation that while change may be visible in practices related to symbols, heroes, and rituals in a society, over time as well as across generations, essential values of a culture are very slow to change. The participants in this study attended Al Wakrah Girls Independent Preparatory School. The school is located in a small urban centre just outside of Doha, the capital of Qatar and is the only girls’ Independent School in the town. Although the girls who attend the school are mainly Qatari or from other Arabic-speaking backgrounds, they have diverse family and socio-economic backgrounds. Some come from families that are very progressive and have embraced the rapid pace of change in Qatari society, while others are from homes where more traditional behaviours and attitudes dominate. This dichotomy was apparent through the course of this study in three main areas: educational values, English-language ability, and experience with and use of technology.

**Educational Values**

According to Hofstede & Hofstede’s (2005) Dimensions of National Culture, Arab-speaking countries rank high in the areas of Power Distance, Uncertainty Avoidance, and Collectivism. High power distance in a society normally translates to a school environment that is teacher-centred, where teachers outline the intellectual path of students and initiate all communication. Knowledge in such societies is viewed as the personal wisdom of the teacher rather than an impersonal “truth” that is accessible to all. The teacher-student relationship is based on respect, obedience, and dependence on the teacher by the students. These characteristics contrast with nature of an e-learning community, where the teacher’s role is to facilitate the learning of students who display independence and initiative. In such a community, success depends greatly on the skill and initiative of the student. At Al Wakrah School, rules and policies, teacher behaviours, and available support enabled those students who wished to embrace the e-learning experience to achieve success, within the limitations of their academic, linguistic, and domestic realities. This approach was not welcomed by some students, who felt more comfortable in an environment where they were simply told what to do by an
authoritarian teacher. Such students found it difficult to succeed in a situation where personal initiative was rewarded and work was done relatively independently from a teacher figure. During the interviews, several participants contrasted between those girls who were interested in learning and becoming independent, with or without technology, and those who preferred a highly structured classroom environment. According to Hofstede & Hofstede (2005), people in high-uncertainty-avoidance societies are usually hesitant to try out new ideas and products. They tend to believe in one Truth to which they are privy. These nations have been slower to introduce electronic communication tools, even if eventually they use them as much as low-uncertainty-avoidance cultures. They rely on the advice of “experts” in order to adopt new products and to repair and maintain their property, and tend to use fewer resources such as books and newspapers. In contrast to this traditional orientation, the e-learning initiative at Al Wakrah School is one of open-ended learning with teachers as facilitators. Learning is a more independent undertaking, where students are expected to use the electronic tools and resources and their own initiative in order to achieve educational objectives. There is a strong relationship between a country’s national wealth and the individualism dimension in the culture. Until relatively recently, Qatari society consisted mainly of families associated with the pearl trade, who lived in towns and villages near the coast, and migratory Bedouin tribes. The demands of these livelihoods and the harshness of the environment resulted in strong cohesive groups, usually based on kinship. In this collectivistic society, individuals depended on the family group for protection and survival. With the advent of petrochemical wealth, however, there is evidence of decreased dependence and increased individualism, as citizens have the resources to pursue their own desires. The move to a more information-based economy recognizes and rewards those who show initiative. The experiences of the students in this study illustrate movement along this continuum, as some students who hold on to traditional behaviours hesitate to question and take initiative, while others express confidence in their ability to solve their own problems and achieve success. Collectivist characteristics were apparent among the students in their consistent reference to the group, whether in describing working in groups, or in using “we” and “the girls in my class” rather than “I” to describe experiences. They felt comfortable with the high level of communication and collaboration required by their studies, which suited their culturally inculcated need for belonging. Some described their discomfort when problems or constraints of technology isolated them. In learning, collectivist cultures tend to value learning “how to do,” and fitting in to the group, rather than learning “how to learn,” which may explain the resistance of some girls to work on developing the skills required to be more independent learners, and choosing instead to use the technology to share homework.

**English Language**

Facility with the English language appeared to be linked with students’ appreciation for and enjoyment of their eSchoolbag experience. Those students who were conversant in English generally were not discouraged by the challenges of e-learning, and seemed to appreciate the long-term benefits of the new skills they were required to learn. Throughout the surveys and the interviews, those students who were comfortable responding and discussing in English were usually the ones who recalled positive experiences, whereas those who
recalled being anxious or having difficulties often responded through the translator.

**Technology**

A further salient issue was the students’ comfort with and use of technology for personal and academic purposes. Training staff from the overseas infocomm firms that supplied the educational product were present at the school in the early weeks to introduce all students and teachers to the use and care of the hardware and software. They provided additional support and training on use and troubleshooting to the Program Manager to enable her to take on the role of technology support once they left the school. Some students came from families where one or both parents used computers for work or recreation, where students had their own personal computers, and were comfortable using them independently. These students were able to address school requirements and their own interests and needs via the technology. One student, for example, was pleased that she was able to complete her work on her home computer, accessing the course website and completing required assignments when she did not have the school laptop at home. In contrast, those students who did not have computers or Internet connections, or academic and technological assistance from family members at home, were required to complete some assignments during their break time at school. With regard to social and recreational uses of the school laptop, students who had their own computers at home did not feel a strong need to load games, music, or other software onto the school laptops, a practice that was frowned upon by the administration.

**Essence of the experience**

The e-learning experience of the participants in this study reflects an interaction between components of Garrison, Anderson, and Archer’s Community of Inquiry and Hofstede’s Cultural Dimensions, within the context of a school-aged population. The resulting experience comprises three essential elements: motivation, belonging, and adjustment.

**Motivation**

Motivation among the students was a result of conditions and goals that encouraged experimentation and adoption of new approaches. Familiarities with the English language and with computers were enabling conditions for many students. This, along with goals of educational and professional success, provided encouragement to adopt e-learning practices, as well as to experiment with technology and new forms of relationships, such as that with a teacher/facilitator. Students who expressed awareness that the skills they were learning through the eSchoolbag project would be transferable to future studies and employment generally showed greater motivation to persist in the face of challenges.

**Belonging**

Students’ appreciation for the social element of e-learning, that is, the increased opportunity to communicate and interact with other members in the group, reflects the values of a collectivist society as described by Hofstede. Such societies exhibit strong commitment and loyalty to the member group. Several students emphasized the fact that they often worked in groups rather than alone, and that they helped each other and viewed themselves as an important part of the class. They expressed discomfort at times when they fell behind the class due to difficulties with the technology. They also expressed a strong interest and concern for marks, which they use as an indicator of their place in the group. The conflict experienced by several students between communicating for social purposes and academic purposes represents another aspect of this strong group
identification. It may also reflect different priorities of school-aged e-learners as opposed to adult e-learners.

A highlight of the teaching element in the students’ experience was the atmosphere of openness and communication with their teachers and other adults in the program. Hofstede describes:

“In the large-power-distance situation, the parent-child inequality is perpetuated by a teacher-student inequality that caters to the need for dependence well established in the student’s mind. Teachers are treated with respect; ... students may have to stand up when teachers enter a classroom. The educational process is teacher centered; teachers outline the intellectual paths to be followed. In the classroom there is supposed to be strict order, with the teacher initiating all communication. Students in class speak up only when invited to....” (2001: 53)

In fact, the students who participated in this study described a student-centred educational process, where they were welcome to initiate communication with teachers or other support staff and encouraged to solve their problems independently when possible. Despite this, there remains a strong respect for the teachers, with the students indicating that the teachers had received extensive training and were available to them when required.

**Adjustment**

A high-uncertainty-avoidance index for Arab-speaking nations hints at the hurdles being faced by some students in accepting an educational approach that runs contrary to many aspects of their traditional culture and experience. Adoption of screen over paper and increased responsibility for learning require adaptation. The low response rate for the survey, as well as students’ reports of the reticence of classmates to embrace e-learning, are indicators of a low tolerance for change and a preference for highly structured situations. Even students who valued the presentation, interaction, and independence of e-learning at school admitted that, when they returned to their home environments, the challenges of the innovative content and medium could still prove discouraging.

Motivation, belonging, and adjustment formed the essence of the e-learning experience for the students in this group. Despite a disparity of skills in academics, technology, and the English language, all participants described issues with each of these elements.
Conclusion
The purpose of this study was to describe the experience of students in the e-Schoolbag program and to suggest means of support to enhance student success and enjoyment. The results add to the body of knowledge about the experience and needs of Arab students in e-learning. Essential elements in the experience were found to be motivation, belonging, and adjustment.

Regarding the cognitive presence in e-learning, the English medium of the content and technological tools was reportedly the greatest factor in the disparity in students’ willingness and ability to initiate, explore, and apply learning, as those students who could use these communication features with ease expressed greater motivation, success, and enjoyment in the program. Social presence was valued, as it addressed students’ need for communication and belonging, especially considering their age and the collectivist nature of their culture. All the participants valued the ability to communicate with teachers and other students in a climate of openness, support, and collegiality. The self-discipline to balance social and academic communication was an issue of concern for both students and staff.

Due to the high power distance of their society and their previous educational experiences, the students viewed the teacher as a vital part of their learning. However, some students expressed eagerness to utilize other sources of knowledge and support, such as the course material and resources, other students, and family members, and felt confident interacting with the teacher as facilitator rather than content expert. Even those students who lacked the confidence or ability to work independently expressed comfort in approaching the teacher with questions and concerns, in contrast to a traditional high-power-distance classroom where teaching presence is evident mainly in one-way communication from teacher to students.

Given the slow adoption of change in traditional Arab culture, it is reasonable that role adjustment for students in the e-Schoolbag program should be a gradual process. Students were positive about the initial training and the ongoing support they received in using the technology. They recognized that individuals were at different points along the continuum between teacher-centred, face-to-face instruction and individualized, independent, student-centred e-learning. They noted the disparity in English and computing backgrounds and personal academic goals and motivation. Some who expressed a desire to embrace e-learning accepted the need for administrative control and guidance as students gradually gained independence and responsibility to monitor content and communication for themselves. The willingness of some students to embrace a form of learning that contrasts with the traditionally high power distance, high uncertainty avoidance, collectivistic culture of Arab-speaking nations provides a glimpse of the change occurring in Qatari society in pursuit of the goal of modernization.

In order to successfully address issues of motivation, belonging, and adjustment, support must address these from the students’ own cultural perspective. Design should recognize that, this being a society in transition, the two critical skills of technology and English language are not equally distributed among the population. Additionally, those students who possess these skills to a lesser degree may do so because their home environments are culturally conservative and have not embraced rapid changes taking place in the greater society, thus precluding the home as a source of supportive educational values and motivation. Gradual, consistent implementation, starting with computer-based
learning in the classroom at an earlier age, under the guidance of a properly trained teacher, might help develop independent learning skills and appreciation for the computer as a tool and resource for learning, not merely for social and recreational uses. Increased structured time on computers at school might help students gain greater skill and confidence with technology, and thus ease the transition to home use. Development of adequate hardware, software, and infrastructure, such as an effective wireless network in the school, before implementation, would make the technology more transparent from the onset and help build positive attitudes. Additionally, policies, procedures, and course design that are equitable for all and do not penalize those students who do not have computer or internet access and support at home would promote a positive view of e-learning. Course design and policies that encourage responsible student interaction can provide a sense of security for students accustomed to collective activity, and provide culturally appropriate peer support for those students who find the English language and/or technology challenging.

An appropriate level of English in all content, including enrichment and support, and outside web sites, is necessary to ensure that all students have similar access to content and computer-based support. As this was a very small exploratory study, further research on the students’ experiences with e-learning, including a more in-depth understanding of the process of role adjustment among this population, would be beneficial. Broader studies that enlist participation of a greater range of students would ensure that there are no hidden issues related to the demographics of those who self-select. Because of the very different roles of males and females in Islamic societies, a similar study on the experiences of boys in e-learning would also be enlightening. It is hoped that, by understanding the process learners undergo when encountering e-learning methods for the first time, policymakers and distance educators will be better equipped to tailor programs and approaches to the needs of Arab students and national development in the Gulf.
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Integrating e-Learning with Social Networking: A Case Study with School Algebra

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Introduction

Let me first give an unequivocal answer to the question: Do we need to integrate e-Learning with social networking? My answer is “Yes.” Yes, if we want to take e-Learning to the next level of success and universal acceptance.

But what I do mean by social networking in the context of e-Learning? Is it to emulate Facebook or MySpace or some variations thereof, with merely an e-Learning wrapper around it?

No. The focus is on e-Learning, with the best features of social networking integrated into it in an intuitive and holistic way.

One particular feature of social networking that stands out, reinforced by my years of teaching experience, is that students are extremely receptive to learning from their peers. There is an invisible barrier between students and teachers that simply doesn’t exist between the students themselves when it comes to understanding a concept or mastering a solution to a problem.

Students must have the ability to draw on the collective intelligence of their peers, whether from their own classes or from across the country or from around the world. This is where social networking comes in. The Internet has brought the world to the fingertips of students but so has it raised the bar for their attention. A generation brought up on YouTube and Facebook and MySpace will only flock to e-Learning sites that offer knowledge in exciting and innovative ways in a peer-to-peer relationship.

A Prototype

With this as my guiding principle, I created a prototype K-12 e-Learning website (http://www.beyondgpa.com or BeyondGPA for short) for students to help each other in mathematics and science and for nurturing the gifted among them. Why only mathematics and science? Because that’s where the need is the greatest, as several educational reports makes clear. Besides, given my background in science and technology, I wanted to focus on what I could do and not take on what I could not.

When a K-12 student registers with the site, he or she is presented with the following choices:
I want to interact with other students in these areas:

<table>
<thead>
<tr>
<th>CAN HELP WITH</th>
<th>NEED HELP IN</th>
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<tbody>
<tr>
<td>Math</td>
<td>Math</td>
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<tr>
<td>Physics</td>
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<tr>
<td>Chemistry</td>
<td>Chemistry</td>
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<td>Biology</td>
<td>Biology</td>
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<tr>
<td>Computers/Computing</td>
<td>Computers/Computing</td>
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<tr>
<td>Dropout counseling</td>
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Student can identify the subjects they need help in and the subjects they can help with. This is, of course, not set in stone. Any student can ask a question and anyone who feels qualified can respond to it. The process of registration is simply a means to emphasize that this is fundamentally a serious e-Learning site where students can learn from each other in an environment of trust and respect.

Within a few months of operation, it became clear to me from monitoring the BeyondGPA traffic that it was algebra that occupied the minds of most students. It posed the greatest challenge to graduating from high schools. This was brought home to me in a forceful way when I began teaching introductory algebra at a community college in Northern California.

Of my experience I wrote (published in The American Muslim):

“Numerous studies have identified difficulties with algebra as one of the main reasons why high school and even college students were failing to graduate every year. By demanding early mastery in a discipline that Gov. Schwarzenegger called the “key that unlocks the world of science, innovation, engineering and technology,” California has taken a step in the right direction to support the demands of the knowledge-based economy of the 21st-century.

“Teaching at a community college gave me a sense of how unprepared students generally are in algebra when they graduate from high schools. The elementary algebra course included the study of real numbers, linear equations, exponents, polynomials, factorization, quadratic equations, and rational expressions. The first week was revealing. Negative numbers, fractions and divisions, particularly those involving decimals, overwhelmed many students. Calculating something like 54 – (-12) baffled about a quarter of the student who subtracted 12 from 54 to produce a result of 42. Almost half the class was clueless about the order of arithmetic operations, and solved problems like 2 + 4(1/2 + 1/3) as 6(1/2 + 1/3) = 5. Something more complicated like 1/2 + 3/4[2(1/4 + 5/12) + 3/5] threw almost the entire class off.

“It took me an ordinate amount of time to cover the basics and shake off students’ fear of numbers and equations. However, once they sensed the power and beauty of algebra and its relevance, not just to their careers but also to such daily tasks as shopping and driving and lobbying for a cause on campus, they made rapid progress. Convincing them that I would be a patient and sympathetic teacher as long as they made a serious effort at learning algebra also helped.
“There was no denying that if the average student had a better foundation in algebra in middle and high schools, I could have made more progress and even delve into some exciting real-world applications before the semester ended. "During spring break, the National Mathematics Advisory Panel released a 120-page report that stated, “Although our students encounter difficulties with many aspects of mathematics, many observers of educational policy see algebra as a central concern. The sharp fall off in mathematics achievement in the U.S. begins when students reach late middle school, where, for more and more students, algebra course work begins …” Three words summarized the panel’s recommendation: “Focus on algebra.”

“This should particularly appeal to Muslims with expertise in algebra. After all, the word algebra comes from the Arabic word “al-jabr” from the title of the book “al-Kitab al-muhtasar fi hisab al-gabr wa-l-muqabala” by the great Muslim mathematician Al-Khwarizmi (780-850) who invented the field.

SAMPLE QUESTIONS AND ANSWERS ON ALGEBRA

Here are some of the questions and answers on algebra posted by students on BeyondGPA:

Question (Grade 8)

Our math teacher gave us this problem but I can't make head or tail of it. How it is related to what he has been teaching in the class I have no clue. We have been learning about factors and multiples. Can anyone help? Please, no complicated stuff!

A high school band is practicing for a parade. They try marching in rows of 12 but John is left all by himself in a row to bring up the rear. They try marching in rows of 8. Same thing: John is left by himself. They try marching in rows of 3 and still the same result. John, who has a good head for math and is a fine musician too, tells the band director to try marching in rows of 5. John is right: he is no longer marching alone in this arrangement. If the number of musicians in the school lies between 45 and 200, how many students are in the band?

Answer

You are right. At first glance, the problem seems to have no connection to what you have been learning in the class. But if you think about it for a while, the band problem soon reduces to a problem of lowest (or least) common multiple (l.c.m.)

When the band marches in rows of 12, 8 or 3, only one student - John - is left alone in a row. Let's ignore John for now and ask, what is the least number of students who could exactly fill a certain number of rows, if they were to march in rows of 12, 8 or 3? This is where the lowest common multiple comes in.

Prime factors of 12: 2 x 2 x 3
Prime factors of 8: 2 x 2 x 2
Prime factor of 3: 3

Taking all the common factors, the lowest common multiple is: 2 x 2 x 3 x 2 = 24

You can verify that 24 is indeed the lowest common multiple because it is exactly divisible by 12, 8 and 3, with no remainder. In other words, if the students were to march in rows of 12, there would be 2 rows. If the students were to march in rows of 8 or 3, there would be 3 or 8 rows respectively. The "Lowest" (or least or smallest) refers to the fact that there is no number smaller than 24 that is exactly divisible by 12, 8 or 3. We could choose 24 x 2 = 48. That would also be exactly divisible by 12, 8 or 3 but it wouldn't be the lowest multiple. We could even choose 12 x 8 x 3 = 288, which would obviously be divisible by 12, 8 or 3 but clearly it is far from being the lowest common multiple of 12, 8 and 3.
Now back to the problem: 24 is the lowest common multiple of 12, 8 or 3. But when the students march in rows of 12, 8 or 3, remember that John is left all by himself (to suffer in silence as an outcast, no doubt!) So the simplest solution is to add 1 to 24. $24 + 1 = 25$. And that is a good answer. If you divide 25 by 12, 8 or 3, there is a remainder of 1, which in our case represents poor John. If, however, you divide 25 by 5, there is no remainder. John is no longer an outcast but feels like a genuine member of the band.

ormally 25 would be the solution, had not the teacher thrown a monkey wrench into the problem. (That is what teachers enjoy doing, don't you think?) The problem states that the number of musicians in the school lie somewhere between 45 and 200. So 25 will not cut it. How about 48 + 1 = 49? Well, if you divide 49 by 12, 8 or 3, you are left with a remainder of 1 but if you divide 49 by 5, you are left with a remainder of 4! That's no good. You can go to the next common multiple of 12, 8 and 3, which is $24 \times 3 = 72$. Adding 1 to 72 gives 73 but that isn't any good either.

Soon you realize that in order to be exactly divisible by 5, a number has to end with either a 5 or a 0. But to get a number that ends in a 5 or a zero after you add 1 to it (remember, we are deriving our result from common multiples of 12, 8 and 3), the common multiple has to end with either a 4 or a 9. A moment's reflection leads you to the conclusion that the common multiple of 12, 8 and 3 will never be a number that ends with a 9. So you have to choose a common multiple of 12, 8 and 3 that ends with a 4. And in our case it has to also lie between 45 and 200.

So you multiply 24 by 4 and 5 and 6. And lo and behold! $24 \times 6 = 144$. Adding 1 to it gives 145. And that's our solution! Divide 145 by 12, 8 or 3 and you are left with a remainder of 1 but 145 is exactly divisible by 5.

So, the straightforward answer would have been 25 but with the condition that the number of student musicians is more than 45 but less than 200 in the school, the answer is 145.

What do you think would the answer be if the number of student musicians is more than 150 but less than 300? Give it a try!

**Question (Grade 11)**

Probability problems confuse me, even the ones that my math teacher calls "simple." (Actually, he uses "simple" a lot. I wish he would stop). Anyway, he gave us these two "simple" problems. What I don’t get is when to add and when to multiply.

What is the probability of obtaining a combined total of either 6 or 7 in throwing a pair of dice?

What is the probability of obtaining at least one head in throwing a coin twice in succession?

**Answer**

For the dice problem, first convince yourself that each dice is independent of the other, that is, what one dice shows does not in any way affect what the other dice shows. When two events are independent, as in this case, you multiply. Think of how many possible combinations there are of the two dice. If the first dice shows 1, there are 6 possibilities for the second dice, 1, 2, 3, 4, 5, 6, because the second dice could show any of these 6 numbers. Similarly, if the first dice shows 2, there are the same 6 possibilities for the second dice. So, for each of the 6 readings of the first dice, there are 6 readings of the second dice. The total number of possible combinations, therefore, is $6 \times 6 = 36$.

Now you have to figure out how many of these 36 combinations add to give either 6 or 7. You can immediately rule out combinations such as (1,1), (1,2) (2,3). Select those combinations that add up to 6 or 7.

For 6, you can have the following combinations:

(1,5) (2,4), (3,3), (4,2), (5,1).
{Try to figure out why (2,4) is different from (4,2) or (1,5) is different from (5,1)}

That’s a total of 5 combinations.

For 7, you can have the following combinations:

(1,6), (2,5), (3,4), (4,3), (5,2), (6,1).

That’s a total of 6 combinations.

In other words, out of 36 possible combinations, only 5 + 6 = 11 combinations yield a total of either 6 or 7. In other words, 11 combinations are “favorable” for the event in question. Therefore, the answer is $11/36$.

How many combinations yield a total of 6? The answer is $5/36$. How many combinations yield a total of 7? It is $6/36 = 1/6$. Do you now see why we added the two probabilities to get a combination of either 6 or 7?

The coin-throwing problem is similar, the only difference being that you have only one coin as opposed to two dice and there are only two possible outcomes as opposed to six. But the fundamental idea is the same in both cases: the events are independent of one another. (Can you think of some cases where events are NOT independent of one other?) In other words, whether the coin lands heads or tails on the first throw does not in any way affect how the coin lands on the following throw.

Because the coin is thrown only two times, it is easy to write down all possible combinations, of which there are only 4: (H,H), (H,T), (T,H), (T,T). We need to figure out the probability of at least one head, which allows for the possibility of getting two heads as well. The combinations are (H,T) (T,H) (H,H). Therefore, the probability is $3/4$. (What is the probability of getting at least one tail in this example?)

However, it is sometimes instructive to solve problems such as this by calculating the probability of the contrary event, that is, how many combinations are there without a single head? The answer is 1: (T,T). If out of 4 combinations, only 1 combination excludes at least one head, then the combination that includes at least one head must be $1 - 1/4 = 3/4$. (Make sure you understand why you subtract from 1).

You will find that sometimes it is easier to figure out the probability of an event NOT occurring and then subtracting the result from 1 to figure out the probability of the desired event occurring.

When an event allows for only 2 possible outcomes, (Head/Tail, Yes/No, On/Off, 1/0), it is called a binary event. As your confidence grows with probability, you will begin using binomial probability distribution formula for calculating the probability of events in a large number of binary trials, such as calculating the probability of obtaining 60 tails when a coin is thrown 100 times. Manually writing down all possible combinations rapidly becomes impractical as the number of trials gets large.

**Reaching Out**

The plaintive pleas for help with algebra, and the timeliness and quality of responses, convinced me of the worthiness of my idea: it is students who can often help other students the most. It also convinced me that gifted students are only too eager to share their gifts with others. It gives them an outlet for their creativity. What better way to nurture their gifts while also harnessing them for the benefit of their less-gifted peers?

In a link called “EduTalk” on BeyondGPA, I began writing on K-12 educational issues that I felt would be of interest to students. In one of the postings, for instance, I wrote of the excellence of the Finnish school system and the facility of Indian students with numbers.

Soon I began to receive requests for posting on BeyondGPA samples of K-12 mathematics questions from Finnish and Indian schools.

Motivated by such requests, I traveled to India (New Delhi and Kolkata) and met with K-12 teachers and bought multiple textbooks for each grade. After several weeks of poring...
over these, I posted sample math questions under a link called “MathIndia.” The response was overwhelming. Teachers, educational entrepreneurs and concerned citizens downloaded hundreds of copies of the samples. Fascination with India’s emergence as an economic and intellectual powerhouse certainly played a role but American students were also genuinely interested in what their Indian counterparts were learning and solving and how they were preparing to enter the inter-connected global economy.

Here are partial samples from three grades:

**Grade 3**

1. Write the numerals for the following number names:
   a. Five thousand seven hundred eighty-six
   b. Nine thousand and twenty-four
   c. Eight thousand nine hundred and ninety-seven

2. Write the number names for the following numerals:
   a. 6783 ii) 2048 iii) 9576

3. Arrange the following numbers in decreasing order:
   a. 9044, 8346, 2087, 9766, 1999, 845
   b. 4142, 4099, 5012, 788, 3600, 6870

4. Arrange the following numbers in increasing order:
   a. 1680, 2456, 307, 6898, 7091, 500
   b. 9546, 7200, 6122, 208, 465, 2100, 3286

5. Nikhil owns two mango farms in the Ratnagiri district of Maharashtra. He harvests 4,848 mangoes from one farm and 3,576 mangoes from the other in one year. How many mangoes does he harvest in all?

6. Jeff, an American tourist, drives from Delhi to the high-tech city of Gurgaon, a distance of 30 km. After a brief stop, he then drives to Agra to see the Taj Mahal, a distance of 196 km. What is the total distance that he drives?

7. Delhi, Agra and Jaipur form the golden triangle, a popular tourist destination in India. Jaipur, the Pink City, is located 258 km from Delhi. From Jaipur to Agra is a distance of 235 km and from Agra to Delhi, 203 km. If Jeff drives along the golden triangle once, how many kilometers does he drive? Convert your answer into miles. Locate the three cities on a map of India and find out how many different ways Jeff can travel the golden triangle once by beginning and ending his journey in the same city.

**Grade 6**

1. Find the value of a) $56 \times (-5)^4 / 52$  b) $(-7)^6 / (7)^3$ c) $40 \times 43 / (-4)^4$

2. The number zero was discovered in India and transmitted to the West by Arabs. What do you get when you multiply any number by 0? When you divide a number by 0? When you divide 0 by 0?

3. In a public library, the ratio of the number of English books to half the number of biology books is the same as the ratio of the number of English books to the total number of computer books. If there are 20,000 biology books and 9,000 English books, how many computer books are there?

4. Ajit is a bookseller. He calculates that if he sells a certain number of books for Rs. 6,500, he will suffer a loss of 15%. So he prices them higher and sells at a profit of 15%. What is his original price and how much did he sell them for?

**Grade 9**

1. Factorize the following expressions:
   a. $x^4 + 4$
b. \( x^4 + 2x^2 + 3 \)
c. \( 1 - 2pq - (p^2 + q^2) \)

2. For the polynomial \( f(x) = 2x^3 - 13x^2 + 17x + 12 \), find \( f(0) \), \( f(-1/2) \), \( f(2) \) and \( f(3) \). Which is a root of the polynomial?

3. The remainder theorem states that the remainder obtained when \( f(x) \) is divided by \( (x-a) \) is equal to \( f(a) \), that is, the value of \( f(x) \) when \( x = a \). Thus, the remainder when \( f(x) = x^3 + x^2 + 2x + 3 \) when divided by \( (x+2) \) is obtained from \( f(-2) = -5 \). Prove this by dividing the given polynomial \( f(x) \) by \( (x+2) \).

4. If the polynomial \( f(y) = y^4 - 2y^3 + 3y^2 - ay + b \) is such that when it is divided by \( (y - 1) \) and \( (y + 1) \), the remainders are 5 and 19 respectively. Find the remainder when \( f(y) \) is divided by \( (y - 2) \).

Grade 11

1. In a triangle ABC, a represents the side BC, b represents the side CA and c represents the side AB. A represents the angle BAC, B represents the angle ABC and C represents the angle BCA. Prove the following:
   a. \( \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C} \)
   b. \( \sin (B-C)/\sin (B+C) = (b^2 - c^2)/a^2 \)
   c. \( \frac{\sin (B-C)}{(b^2-c^2)} = \frac{\sin (C-A)}{(c^2-a^2)} = \frac{\sin (A-B)}{(a^2-b^2)} \)

2. The square root of -1 (\( \sqrt{-1} \)) is an imaginary number represented by the symbol \( i \). You can think of it as the solution of \( x^2 + 1 = 0 \) where \( i^2 = -1 \). It was introduced by the great Swiss mathematician Euler (pronounced “Oiler”, 1707-83). If \( a \) and \( b \) are real numbers, \( (a + bi) \) is called a complex number.
   a. Express \( (5 + 4i)/(4 + 5i) \) in the form \( a + bi \)
   b. Find the inverse of \( (2 + \sqrt{-3})^2 \) and express your result in the form \( a + bi \)
   c. If \( x = -5 + 2\sqrt{-4} \), find the value of \( x^4 + 9x^3 + 35x^2 - x + 4 \)

3. Solve the following quadratic equations. You will need to use the concept of \( i \).
   a. \( x^2 - 4x + 13 = 0 \)
   b. \( 25x^2 - 30x + 11 = 0 \)
   c. \( 3x^2 + 7ix + 6 = 0 \)

4. \( n! \) (“\( n \) factorial”) is defined as the product of the first \( n \) natural numbers. Thus, \( n! = 1 \times 2 \times 3 \times 4 \times 5 \ldots \times (n-1) \times n \). Find
   a. \( 15!/(6! \times 3!) \)
   b. \( (18! \times 12!)/(8! \times 11!) \)
   c. Find \( n \) if \( (n+1)! = 12 \times (n-1)! \)
   d. Prove that \( n! \times (n+2)! = n! + (n+1)! \)

My goal is to post similar sample math problems not just from India, but also from Finland, Singapore, Canada and other countries where students consistently score high in mathematics tests. In my experience, I have found that American K-12 mathematics textbooks are mile wide and inch deep. Too many topics are covered in too little depth that leaves students frustrated and unable to cope. On the basis of data that I gathered from BeyondGPA, I have joined other educators in changing math textbooks to cover less number of topics but in greater depth.

Next Step

My next step is to build a production system using the Web 2.0 technology tools so that e-Learning, with embedded social networking, can become as powerful a draw as social networking sites such as Facebook and MySpace. The Web 2.0 technologies include Blogs, RSS, Wikis, Podcast, Chat, Search, Video, 3D Virtual, and Mobile.

While student-student interaction will remain the focus of BeyondGPA, I also plan to
promote teacher-teacher and parent-parent interactions. K-12 teachers can get help from college and university professors in presenting math and science topics in innovative ways to their students. Parents can share their insights and concerns with other parents about their school-going children. E-Learning must embrace all participants in the K-12 ecosystem to be successful.

Fostering an active, online community of students, teachers, parents, educators and concerned citizens that lead to measurable gain for K-12 students will not be easy. But the opportunities have never been greater and the stakes higher. There have been incremental improvements but we are far from tapping into the full potential of the Web for e-Learning.

Although I created the BeyondGPA prototype in an American context, my ideas are equally relevant for e-Learning excellence in the Middle East. In particular, given the rich Islamic heritage in mathematics and science, particularly in algebra and astronomy, my model is ideally suited to harnessing the aptitude and ability of Middle-Eastern students in these disciplines, informed by the history of our illustrious predecessors. This is a goal I am determined to achieve.
Preparing Teachers to Teach Online

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Abstract
The vast majority of today’s teachers were never taught using computers. They have no firsthand experience using computers for teaching or e-learning. They may even believe computers are a threat to their jobs. Helping these teachers to become effective users and producers of e-learning requires a systematic, multi-layered approach to professional development. First, teachers have to be convinced of their institution’s commitment to online instruction. Then, they need support and guidance as they move through various levels of understanding and concern about what e-learning is and its role and value in education. Finally, teachers need to develop competencies that will enable them to be successful online teachers.

This presentation will provide a brief background on the use of technology in education, research on approaches to professional development, and specific information on the competencies required to be an effective online teacher. A model for teacher professional development related to information and communications technology (ICT) is discussed.

Introduction
Even in the world’s most advanced elementary and secondary schools, computers have only been available for use by students and teachers for a few decades. During that time, huge advances have been made in the kinds of technologies available for use in schools, their educational applications, and our understanding of how to use them to promote learning.
Today, with the Internet and emergence of Web 2.0 applications, schools have the opportunity to use technology in ways that were not even dreamed of when the first computers arrived in classrooms. For example, remote schools, schools with small enrollments, and other schools with limited resources are supplementing their offerings by allowing students to enroll in specialized online courses. Using online courses in this way enables schools to “bring in” experts to offer advanced math, science, and language classes that would not otherwise be available. Conversely, schools with specialized offerings are seeking to increase revenues and promote learning by making their courses available to students outside the schools’ traditional geographic service area. Other schools offer online courses to students who are unable to attend a traditional school, such as, homebound or hospitalized students.
With the increasing opportunities of online instruction comes the increasing demand for teachers prepared to teach in the online environment. This paper discusses the evolution of teacher training on the use of educational technology, the emerging role on online learning, and the unique issues it presents to teachers. It also presents a model for the development of teachers’ online teaching skills.

The Evaluation of Educational Technology Training for Teachers
In the late 1970s and early 1980s, as the first
desktop computers were beginning to appear
in classrooms, professional development
focused on setting up computers, learning
their parts, and running software packages.
This training addressed basic operation and
maintenance, programming, and using
productivity tools (e.g., word processors,
databases, and spreadsheets). Eventually, as
curriculum-related software became available,
the use of grade-level appropriate,
curriculum-specific instructional programs
was integrated into the training.
By the late 1980s, teacher professional
development programs had changed their
focus. No longer was the goal to simply make
teachers competent users. Rather, it was to
help them develop strategies that would
increase the effective student use of
technology for learning. Teachers were
exposed to concepts such as using technology
in collaborative learning environments.
Teachers began requiring students to use
technology as a research tool. Students
connected sensors, gathered and analyzed
data, and presented their findings. Teachers’
roles shifted from using technology for
teaching to using technology to facilitate
learning.
The introduction of the Internet and online
resources in the late 1990s presented another
change in the use of technology in education.
Teachers and students began to browse this
virtual world for information and resources
heretofore unavailable to them. Computers
became a tool for searching, retrieving,
manipulating, and sharing information.
Teachers began to see the online environment
as an information repository that contributed
to student learning and through which
students could contribute to the learning of
others. Teaching strategies began to make use
of this rich resource by including online
research and reporting activities.
By the early 2000s, use of the Internet for
communication had evolved beyond mere text
messages to include a full range of media—
images, audio, and video. Online distance
education quickly gained popularity. All
levels of education began to see online
learning as a vehicle for expanding an
institution’s reach by offering educational
services to students located great distances
from their physical campuses. The concept of
online education presented yet another
opportunity to change the role of teachers.
Today, the personal relationship between
teachers and students, which was so often a
critical component of classroom instruction,
has taken on an entirely different character.
Web 2.0 has enabled the creation of new
community-oriented learning environments in
which learners share information and build
knowledge together. As a result, online
distance education courses create instructional
environments where teachers and students
often interacted with each other in a
completely digital world. The personal
relationships between students and teachers
have changed. In many instances, students
and teachers might never meet, speak, or even
see each other in person.

Online Distance Education

Online distance education (also commonly
referred to as e-learning, distance education,
online learning, online teaching, and
distributed learning), as the name implies,
delivers instruction using a computer
network, without requiring face-to-face
meetings of students and faculty (Arabasz &
Baker 2003). These online courses, taught in
virtual classrooms, are often facilitated by use
of the Internet (Spector & de la Teja 2001),
and may be synchronous, asynchronous, or a
combination there of.
Online distance education and e-learning offer
exciting opportunities for learners, teachers,
and educational institutions. Internet
technology allows distance education to make
efficient, content-rich, interactive learning
opportunities available to learners at locations
and in ways previously not possible. For an increasing number of institutions, this capability is broadening and extending their methods of delivering education. This heightened interest has resulted in online distance education has being the focus of numerous research studies, position papers, standards documents, and guidelines. These documents (e.g., The Institute for Higher Education, April, 2000; The Higher Education Program, and Policy Council of the American Federation of Teachers, May, 2000; Twigg, 2003a, 2003b; Sales, 2005; Sales, Al-Barwani, and Miske, 2008; Sales and Al-Rahbi, 2008; Smith, 2005), address the relative instructional effectiveness of online learning, educational quality, student needs, institutional support, instructional strategies, costs, online teacher competencies, and more. One report, Quality On the Line (The Institute for Higher Education 2000), studied six institutions actively involved in online education and constructed a list of 24 “benchmarks that are essential for quality Internet-based distance education” (p.25). These benchmarks represented seven categories:

1. Institutional Support
2. Course Development
3. Teaching/Learning
4. Course Structure
5. Student Support
6. Faculty Support
7. Evaluation and Assessment

Across all levels of instruction, the responsibility for achieving these benchmarks is shared by institutions, teachers and their program areas, and students. However, teachers are most often focused on the following benchmarks: 2. Course Development, 3. Teaching/Learning, 4. Course Structure, and 6. Faculty Support. These benchmarks highlight the areas in which online teachers must be competent.

**A Model for Preparing Teachers to Teach Online**

Preparing teachers to participate effectively in online instruction, particularly as it relates to the benchmarks identified above, requires carefully structuring professional development. The model below (Figure 1) illustrates the critical components an online teacher professional development program should address.

As a hierarchical model, Figure 1 suggests online teacher training begin by assessing and addressing teachers’ readiness to change. Teachers’ readiness is indicated through the concerns they express about the impact of online teaching and learning. The model then moves into increasing teachers’ comfort level with online technologies. Comfort levels relate to how teachers perceive the quality of instruction, their correlation of online instruction with the values of their institution, and their beliefs about the ease with which they will be able to teach using online instruction. Only after these issues have been addressed should teacher training and preparation focus on developing teachers’ competencies to teach online.
The remainder of this paper is devoted to explaining and supporting the elements of this model and the progression it proposes.

**Readiness for Change: A Concerns-Based Approach**

For many teachers the transition from teaching in a classroom, where they have direct and personal contact with all of their students, to online teaching, where interactions are often restricted to a virtual environment, is a significant change. The process of change often involves exposing
teachers to and integrating them in a number of technology-based teaching and learning activities. The goal is to increase their knowledge, skill, and confidence in the use of educational technology over time. The level of teacher readiness for online distance education training should be assessed prior to integrating teachers into any formal training experiences. Loucks-Horsley (1996), while studying teacher acceptance of change in science curricula, proposed that teacher readiness for change can be determined by the types of questions or concerns teachers express about the change or innovation being considered. This concerns-based approach identifies a seven-level hierarchy of teacher readiness (see Table 1).

<table>
<thead>
<tr>
<th>Stages of Concern</th>
<th>Expression of Concern</th>
</tr>
</thead>
<tbody>
<tr>
<td>6. Refocusing</td>
<td>I have some ideas about something that would work even better.</td>
</tr>
<tr>
<td>5. Collaboration</td>
<td>How can I relate what I am doing to what others are doing?</td>
</tr>
<tr>
<td>4. Consequence</td>
<td>How is my use affecting learners? How can I refine it to have more impact?</td>
</tr>
<tr>
<td>3. Management</td>
<td>I seem to be spending all my time getting materials ready.</td>
</tr>
<tr>
<td>2. Personal</td>
<td>How will using it affect me?</td>
</tr>
<tr>
<td>1. Informational</td>
<td>I would like to know more about it.</td>
</tr>
<tr>
<td>0. Awareness</td>
<td>I am not concerned about it.</td>
</tr>
</tbody>
</table>

Teacher concerns move from the lowest stage, Awareness, upward. At the lowest stages, stages 0 through 2, the teacher is considering the innovation as a teaching tool. During stages 3 and 4, the teacher’s energy is focused on using and refining use of the tool to optimize teaching and learning experiences. The highest two stages, 5 and 6, show teachers moving into the creative realm that extends the innovation further into unanticipated or undeveloped areas. Naturally, different teachers will move through the hierarchy at different rates and many may never reach the upper levels. Training should be geared to the level of readiness being expressed by a teacher. In a recent project in the Sultanate of Oman, Sales (2007) reports seeing teachers express concerns from the lowest levels to the highest. Some teachers, although asked to participate in a pilot of online teacher training, simply chose to ignore the opportunity (Stage 0). Others expressed their concerns by asking questions about the project’s purpose and the amount of time they would need to commit to it (Stages 1 and 2). Even further up the hierarchy teachers expressed concern about the time it was taking away from other instructional approaches and possible effects on students (Stages 3 and 4). Within Oman’s Ministry of Education some of the trainers participating in the project began suggesting modifications and adaptation of the online learning to better reach learners and achieve desired outcomes (Stage 6).

Clearly, in some situations, the full spectrum of concerns may be represented within the population to be trained. In these cases a series of training interventions will likely be required to reach teachers at different levels of concern. Institutions, having limited resources for the integration of an innovation, may need to make decisions about their ability to provide training to teachers at every level.

**Suggested Teacher Training Readiness Activities**

- Administer an instrument to determine teachers’ levels of concern.
- Group teachers with similar levels of concern for training.
- Discuss what teachers like most about classroom teaching and how online
teaching can provide similar opportunities.

- Discuss what teachers fear/don’t understand/dislike most about online teaching.
- Use a variety of online communication tools to solicit teachers’ suggestions for changes or training that could be made to make online instruction more appealing to them

**Comfort with Online Technology: Characteristics Influencing Adoption**

There are many political, cultural, economic, ethical, environmental, and resource issues that can have an impact on teachers’ ability to prepare for and use online distance education. For example, Sales and Emesiochil (2004) report on a civil service retirement act in the Republic of Palau which forced technology-trained teachers into retirement and flooded schools with untrained teachers. Sales and colleagues (Sales, et. al. 2008) also report how a number of teachers in the Oman resisted the adoption of online training because they felt it required them to participate in training on their own time. Historically in Oman, teachers had been released from their teaching responsibilities to participate in face-to-face training.

Further, an individual’s level of readiness is strongly influenced by his or her personal beliefs as well as the environments in which he or she lives and works. Teachers’ perceptions of a specific educational technology and beliefs about their own ability to use it easily, successfully, and with better results strongly influence their willingness to consider adoption of that technology. In their chapter on the adoption of learning technologies, Wilson, Sherry, Dobrovolny, Batty, and Ryder (2001) argue in support of the validity of the STORC approach (Rogers 1995) when applied to technology interventions in education. STORC is an acronym for a set of characteristics considered during adoption of innovations. These characteristics represent attributes or conditions that must be evaluated favorably before an innovation has sufficient appeal to reach a given level of adoption. In addition to the original set of characteristics (simplicity, trialability, observability, relative advantage, and compatibility), Wilson, et. al. (2001) proposed a condition of Support be added, thereby changing the acronym to STORCS (see Table 2).

<table>
<thead>
<tr>
<th>Category</th>
<th>Characteristic</th>
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</thead>
<tbody>
<tr>
<td>S</td>
<td>Simplicity</td>
</tr>
<tr>
<td>T</td>
<td>Trialability</td>
</tr>
<tr>
<td>O</td>
<td>Observability</td>
</tr>
<tr>
<td>R</td>
<td>Relative Advantage</td>
</tr>
<tr>
<td>C</td>
<td>Compatibility</td>
</tr>
<tr>
<td>S</td>
<td>Support</td>
</tr>
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</table>
The categories of characteristics in this approach may be independent of each other, or may have an influence on each other. However, they do not have a hierarchical or ordinal relationship. Rather, the point Wilson and his co-authors make in their presentation of this approach is that the more characteristics present, the greater the likelihood an innovation will be successfully adopted.

Professional development programs must consider teacher responses to each of the question types listed in the STORCS approach. Training interventions should help teachers understand and generate thoughtful and positive answers to these questions. Teachers’ affirmations of these questions will significantly influence their approach to and enthusiasm for online teaching.

**Suggested Training Activities to Increase Teachers Comfort**

- Inform teachers well in advance of when the training will be taking place and the expectations for their full participation.
- Help teachers understand the rational for the adoption of technology and the economic justifications.
- Help teachers understand that technology is a tool teachers use to improve their teaching. Use videos, testimonials, and discussions to illustrate this point.
- Remind teachers of the reasons for using technology, such as:
  - Reach underserved populations,
  - Prepare students for the world they will live and work in,
  - Access information and communicate in ways otherwise not possible, and
  - Improve teaching and learning.
- Immerse teachers, over time, in progressively longer online learning experiences that model best teaching practices.
- Involve teachers in online instruction by having them make presentation to others, share ideas, or model new teaching techniques.
- Work through relevant questions from the STORCS approach with teachers

**Design**

The EDUCAUSE Center for Applied Research (ECAR) recently sponsored a study to examine the e-learning activities in higher education entitled, Evolving Campus Support Models for E-Learning Courses. In a summary of the report’s findings, Arabasz and Baker (2003) identified major concerns of online teachers related to distance education.

The first concern cited was “lack of knowledge to design courses with technology” (p.4). This concern is further supported by the work of Siragusa (2000). He argues that online teachers who do not possess the necessary skills in instructional design are increasingly being encouraged to develop online courses. He states:

“Instructional design decisions that lead to the way in which students learn on the Internet are being placed in the hands of lecturers who are only just coming to grips with online learning and the use of the Internet. ... Research and development for online learning has not yet caught up with the pace at which courses are appearing on the Internet. Instructional design principles that were developed for computer-assisted instruction appear to be overlooked by those now developing materials for the Internet” (p.1).

Instructional design is the process of planning for the development and delivery of effective education and training materials. Instructional designers use a variety of models that ensure a careful and systematic process is employed. Effective processes begin with a needs
assessment and continue on to examine content/learning requirements, learner needs, the learning environments, delivery systems, tools, and resources available for development and delivery, as well as other resources and constraints that will impact the project (e.g. financial resources, time available for the project, talents and experiences of those working on the project, social or political pressures). This information is then used to develop learning outcomes, select instructional strategies and techniques, and guide the selection of instructional resources and the development of course content.

When applied in distance education, or other forms of course development, instructional design results in carefully structured and thoroughly documented plans for the production of the online course materials. These plans provide an opportunity to carefully review content, and sequence methods and assessment to ensure the most instructionally sound course is being developed. This documentation also serves as an excellent resource when conducting maintenance evaluations or implementing revisions to the course content, structure, or function.

Concerns are expressed among online teachers and distance education scholars regarding the preparation of teachers to create courses for the online environment. These concerns highlight the need for professional development programs that emphasize the creation of instructional design competencies among those responsible for course production. An alternative used in some settings is to develop teacher competencies for working with a team of professional instructional designers and course developers.

**Suggested Instructional Design Training Activities**

- Explain the purpose and value of systematic instructional design to teachers.

- Expose teachers to simple, yet comprehensive, instructional design models.

- Illustrate effective instructional design procedures and share design documents with teachers.

- Provide instructional design tools and templates that will enable teachers to quickly begin designing sound online materials.

- Allow teachers to practice instructional design in low-risk settings where they can receive support and perfect the craft.

- Offer reviews of design documents before teachers attempt to implement the training they have designed.

- Critique the instructional design of online courses as a method to promote improved designs.

**Development**

Course development is the actual production of the online course and supporting instructional materials. Where a learning content management system (LCMS) is being used, online course development is likely to involve teachers in populating content presentation templates with text, graphics, photographs, and other instructional resources. Working with the template interface and different media assets that need to be in the appropriate digital formats can be technically demanding. Since most teachers are not familiar with production software, this often presents a challenge to be addressed through support services or as part of the professional development program.

In the commercial e-learning development world, course production is a team process. Subject matter experts work with instructional designers, programmers, Web-developers, graphic artists, animators, database specialists, and media production professionals. Through a collaborative and iterative process the instructional design is
transformed into a functioning online course presentation, complete with management, record-keeping, and other administrative features (Sales 2002). Most institutions, however, expect online teachers to acquire the skills needed to develop and maintain their courses. Arabasz and Baker (2003) report that across all levels of higher education institutions, only 8% of institutional effort directed at online learning is spent on creating e-learning course elements. Instead of investing in course development, institutes are devoting resources to such areas as Web-based development tools, online references and resources, listservs, and help desks.

Some efforts to use a team approach have been undertaken in higher education (Wells, Warner & Steele 1999), however, most institutions require instructors to create the course they teach online. Anne Arundel Community College has attempted to provide blended solution. The College created an Online Academy to help instructors develop skills needed to prepare and deliver online courses. Still, the online teachers are still expected to develop their courses “using software he or she is comfortable working with.”

Each professional development program for online teachers needs to determine its own institutional competency requirements based on the unique combination of delivery system components and support options. At a minimum, teachers need to have a thorough understanding of development options and the vocabulary necessary to communicate with other members of the development team.

Suggested Training Activities Related to Online Course Development

- Introduce teachers to the course management environment with which they will be working (e.g., D2L, Vista, Snap!).

- Discuss the institutional resources that will be provided to support the development of new online courses.

- Determine the teachers’ familiarity and competencies with basic media production tools (i.e., tools that are needed to produce, edit, and manipulate the media assets used to create online instruction).

- Provide opportunities for teachers to work with the media production support staff that will be assisting them in the production of online courses.

- Create, share, and critique mini-online courses as part of the training program.

Facilitation

Another significant concern of online teachers identified by Arabasz and Baker (2003) was “a lack of confidence in use of technology in teaching” (p.4). This concern is well founded given that online instruction requires teachers to use a variety of tools and techniques which are new to them. One of the recognized keys to the success of online courses is the facilitation of learning by online teachers (Salmon 2000; 2002; Jaques & Salmon 2006). This facilitation involves online communication with students and the creation of online learning environments that require or encourage communications between students. Stamper and Sales (2001) state that through frequent, timely, and personal communications with online students, teachers create the perception that they are close at hand—a “close apparent distance.” They argue this communication enhanced relationship helps distance learners feel they are recognized contributing members of the course. Stamper and Sales go on to suggestion that by creating a close apparent distance, instructors can increase learner satisfaction with online courses and reduce drop-out rates. Salmon (2000, 2002) has conducted action research and published on the facilitation of
online courses. Her work illustrates to teachers what she believes are critical skills and techniques specific to facilitating online courses. Through effective use of the E-moderating and E-activities behaviors she promotes, Salmon believes online learning opportunities can be optimized. Facilitation skills are essential competencies to be included in online teacher development. Training should include modeling of techniques that increase communications between the teacher and students as well as among students. Teachers should be encouraged to plan frequent communications and activities that promote communication. In addition, they should promptly address specific student needs or requests identified by students.

**Suggested Teacher Training to Facilitate Online Courses**

- Work with teachers to identify facilitation opportunities and challenges that may occur in online learning settings (e.g., establishing a sense of community among students and with the teacher, answering questions for students working at a distance, encouraging collaboration among students on projects, teaching problem-solving methods).
- Discuss how addressing these challenges are different when working in an online setting.
- Review tools and techniques available to teachers to help them establish a “close apparent distance” with their students.
- Conduct role playing activities that give teachers the opportunity to experience the challenges faced by both the teacher and the student in these settings.
- Challenge teachers to include facilitation strategies in their course designs.
- Provide opportunities to practice and refine facilitation techniques prior to implementing large online courses

**Legal and Ethical Issues**

Numerous legal and ethical issues are associated with online distance education. Copyright law, which many countries have special interpretations of when it comes to online courses (Hoffman 2000), is often seen as the only legal issue of concern. However, Ko and Rossen (2001), in their book on online teaching, identify a range of issues including copyright, acceptable use, plagiarism, and ownership of the newly created course materials. Mpofu (2002) provides a more comprehensive list by including discussions of privacy and licensing/piracy. Professional development for online teachers must examine all relevant legal and ethical issues. Issues such as copyright and ownership need to be considered from the perspective of how they will influence design decisions. Acceptable use and plagiarism should be covered as they relate to informing students of institutional policies, posting information online for others to access, and evaluating student work. Issues of software licensing and piracy may influence decisions related to development and delivery environments, as well as assignments given to students. Finally, the legal and ethical issues associated with data privacy in terms of students’ records and personal safety should also be addressed.

**Suggested Teacher Training Activities on Legal and Ethical Issues**

Review the relevant laws and policies of your country with learners. Recognize that some of your learners may be in other countries and you may need to consider whether the laws of those countries apply to you. Address copyright issues, fair use practices, and procedures for seeking permissions to use protected materials.
Discuss how students’ personal or private data, such as home addresses, phone numbers, or health information, can be protected while still creating a sense of community online. Provide opportunities for teachers to critique the examples of online courses for legal and ethical issues.

Guide teachers in the design of standards of behavior that will be shared with students. These activities should address issues such as copyright, fair use, plagiarism, piracy, and privacy.
Conclusion

Professional development to prepare teachers for online distance education must accommodate the unique needs of each individual teacher. Teacher concerns, readiness to adopt new technologies, and an institution’s specific policies, systems, and support services all contribute to the need for individualized or custom tailored training experiences.

Institutions and trainers must recognize that development of online teachers is an on-going process, not a single event. Professional development programs need to offer a series of progressively complex experiences that move teachers along a continuum. Taking teachers from an entry point based on each teacher’s unique needs to an exit point based on institutional competency standards should be the goal.

Professional development programs should engage teachers in activities that move them from their current level of understanding in each of the follow domains.

- Readiness for Change – teacher readiness for change can be determined by the types of questions or concerns they express about the change or innovation being considered.
- Comfort with Online Technologies – teachers’ beliefs about their own ability to use it easily, successfully, and with better results strongly influence their willingness to consider adoption of that technology.
- Design – analysis, instructional design, creative design, and, in some cases, interface design. This domain encompasses the skills and processes necessary to take a course from the concept stage to the point where it is ready for production.
- Development – creation of the media assets that support the content (produced during the design phase), production of the software product (through programming or the use of a tool), and quality assurance testing. The development domain begins with the design and ends with a fully-functional, error-free course.
- Facilitation – instructor skills and behaviors, and strategies and techniques for course delivery. Facilitation involves taking the completed course and creating a dynamic learning experience for students. This domain involves teachers in presenting content, engaging students, providing feedback, and otherwise creating a positive learning environment online in support of the “automated” portion of the course.
- Legal and Ethical Issues – laws, rules, regulations, policies, procedures, and associated consequences. This domain, as shown in the Competency Model (Figure 1), overlaps the other three domains. Legal and ethical competencies influence teachers’ execution of competencies in each of the other domains.
References


Networked Readiness in the United Arab Emirates

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Abstract
This paper presents an overview of the current status of networked readiness in the United Arab Emirates, particularly in Dubai. It explores technology readiness status of different sectors in the light of factors stimulating its growth or barriers limiting its development. Based on actual readiness indicators, networked readiness was judged in the following sectors: e-government, e-education, e-health, e-commerce and business. The paper also points out the importance of the creation of Arabic content to match the digital development. Suggestions for successful technology diffusion and integration within each of the sectors are offered. Recommendations for development of Arabic content are discussed in order to meet the local needs. Future research needs are identified.

Introduction
Technology has tremendously changed the way the world works. Digital information has innovative value and generates new power to bring diverse changes to practices in different fields. The growing emphasis on knowledge-based economy, and innovation as key factors for global competitiveness brings worldwide challenges and development opportunities. While at the beginning of the 21st century technology penetration was in its early stages in Middle Eastern countries in general, there have been giant steps in the Arab Gulf Countries and particularly in the United Arab Emirates (UAE). Recently, the Middle East was identified as the most dynamic region in the world for internet access (Global Information Technology Report (GITR) 2007-2008). Due to its rapid growth and vibrant economy, the UAE is described as the most wired country on earth (Walters & Quinn, 2003) and the most active of all ESCWA countries (Aita, 2006).

The importance of technology diffusion has gained prominence on the UAE government agenda, from its recent belief that the adoption of technological tools can help the country fulfill its economic national potential and diversify its economy from merely oil dependent to include knowledge-based industries. The government has accomplished great achievements to integrate Information Communication Technology (ICT) into the geographically small country by providing robust telecommunications infrastructure applications, creating different developmental projects, and computerizing public administration.

It also placed “a very high priority on ICT-based educational initiatives” (ESCWA, 2005. p.5) to support and adopt innovative learning technologies in schools and universities. The nation has become a major player on the international level. It has made tremendous efforts to transform the country into a modern, high-tech, knowledge-based society through the establishment of numerous initiatives to attract information technology firms to the country.
Dubai, the leading city in adopting technology in the country, is identified as the ICT innovative hub of the region (Dutta, Shalhoub & Samuels, 2007). However, there are very few studies that address the current status of technology use and integration in the country. This paper attempts to gain an understanding of the country networked readiness by drawing upon factors limiting or enhancing technology integration in different key sectors and reveals the obstacles to optimal technology usage.

**Networked Readiness**

E-readiness is a relatively new concept that contemporised the rapid rate of Internet penetration throughout the world, and the dramatic advances in uses of information technology (IT) in business and industry (Choucri et al., 2003). It is a constantly shifting phenomenon determined by a complex interaction of factors (GITR, 2001-2002). Numerous attempts have been made to define readiness and specify means to assess it. The Computer Systems Policy Project (CSPP) defines readiness as the level of development of a community to ensure that e-commerce can thrive and deliver real value to a community (CSPP 2000 as cited in Dutta and Jain, 2003). On the other hand, the Asia-Pacific Economic Cooperation (APEC) readiness guide defines readiness as the level of preparation of a community to participate in the increasingly networked world (2000). A more comprehensive definition is provided by the Centre for International Development at Harvard University, where networked readiness is defined at the macro level as “the degree to which a community is prepared to participate in the networked world” and “the community’s potential to participate in the networked world in the future” (GITR, 2002, p.11). This definition will be implemented throughout this paper as it implies the actual preparedness of a certain community as well its future potential to contribute and “benefit from the ICT developments” (Dutta, Carlos & Mia, 2006, p.9). A Networked Readiness Index (NRI) is an indicator that measures the tendency of countries to use the opportunities offered by ICT. It helps nations monitor and evaluate their technology status against international standards and build a roadmap or modify strategies for future global competitiveness.

According to the Networked Readiness Report editors, three community stakeholders play a key role in determining a country’s readiness in a certain ICT environment namely: a) individuals; b) businesses; and c) governments. These stakeholders interact within their particular environment in related efforts to leverage technology use (Dutta & Jain, 2003). Implementing new information and communication technologies brings changes to their interactions, lifestyles, and to other economic factors. The amount of economical benefit from technology adoption at the nation level depends on the extent to which all stakeholders use and adopt ICT technologies. The process must involve moving beyond the readiness stage to reach the usage and adoption stage that includes exploiting the opportunities offered, in order to reach the optimal range of national productivity and economic growth.

With the advent of the digital technology age, it is becoming imperative that adequate contribution in the national economy has to meet a certain level of ICT readiness; since competitiveness at the global level is always associated with e-preparedness.

**The ICT Environment and infrastructure in UAE**

ICT is a powerful global tool for development that resulted from the merge between Information Telecommunications and Data Networking technologies. Information and telecommunication infrastructure is defined as
the “telecommunication and information networks through which information is transmitted, stored, and delivered” (World Bank’s ICT Sector Strategy as cited in the World Bank Report, 2005, p.25). It is globally sought after for its ability to foster knowledge dissemination, provide zero cost services and enable easy knowledge management. It became one of the core foundations underpinning knowledge economies and sustainable social and economic development. Developing a supportive ICT infrastructure is a major prerequisite for a nation in setting a platform for network access. It has a great impact on the communities and influences people’s communications and interactions. From this perspective, the UAE is highly prepared for the new ICT upsurge. This is evident in the modern ICT infrastructure that has been built. It incorporates a robust communication network that provides the subscribers with the region’s highest bandwidth capacity at 10 Gbps and a wide range of telecommunications services. In addition, the basic Internet Indicators in the Arab countries demonstrate that the UAE is a leader in terms of ICT proliferation. The level of investment in the telecommunications network, its expansion and its improvements has led the country to be among the area’s highest ranking countries in telephones penetration, mobile subscribers, and Internet penetration. The ICT use index (2006), as reported by Madar Research Group, shows that the UAE “remained the Arab leader in terms of Internet user penetration rate in 2005 [NPI =1.84 in 2005 and 2.25 in 2006], followed by Bahrain and Qatar” (as reported in Hancock, 2006). The index covers four parameters: PC installed base and the number of Internet users, mobile phones and fixed lines. The country’s infrastructure is considered a modern state of art that has major implications on enhancing the country’s competitiveness and digital readiness (ESCWA, 2005). At a more global level, the UAE is ranked 29th on a world scale for its technological readiness (GITR 2007-2008). With all the above factors that favour the country’s readiness, the primary shortfall in the telecommunications infrastructure seems to be a limited private sector led competition. The Emirates Telecommunications Corporation, ETISALAT, held a monopoly position. It was the only telecommunications service provider in the country from 1976 until February 2007. Having the highest prices for telecommunication services in the region, the government allowed other suppliers to offer their services in order to increase competition and thus improve quality and services while decreasing prices. Only in 2007 did the change start and the market turned into a duopoly when the “Emirates Integrated Telecommunications Company” (EITC) marketing itself as “du” was introduced to the market. However, still there is a need to open the ICT market to multiple suppliers to increase competition. On the other hand, with the spectacular achievements in ICT development, there was no strategic ICT strategy to set priorities, key initiatives and define the timeframe for the implementation of plans before the year 2005 (Aita, 2006). The reason for creating many projects was not clearly based on an adopted national strategy rather than on giant developmental business projects. With the presence of huge and creative initiatives in the country, there are two important facts: a) the need to assess the effectiveness of the initiatives and the efficiency of implementing them; and b) the need to manage the risk and success associated with their implementation. Nevertheless, the government established a regulatory authority body, the TRA or the Telecommunications Regulatory Authority by a Federal Law in 2003. The TRA has many roles mainly to ensure adequacy and quality of telecommunication services, to adhere to
terms of licenses and to resolve disputes (ESCWA, 2005).

**Sectors’ Readiness**

In this paper, networked readiness in the UAE is addressed by focusing on a variety of key sectors in the nation’s economy that are vital in judging readiness and usage of technology. For each sector, we look at factors stimulating its growth as well as barriers limiting its development. Key sectors addressed are:

1. ICT sector
2. E-government
3. E-education
4. E-health
5. E-Commerce and Business

**ICT Sector**

The ICT sector is a dynamic one and the backbone of all other sectors, it supplies the latest technologies and services. It is defined as a combination of manufacturing and services "primarily engaged in producing goods or services, or supplying technologies, used to process, transmit or receive information" (Economic Co-operation and Development (OECD), 2008). It is a heterogeneous sector that is divided between industries that manufacture information processing products or computers and their equipments and services intended to enable the function of information processing like consulting in IT systems and software development.

The policy framework in the UAE allowed this sector to boom, offering enormous opportunities for ICT companies. Developmental efforts of the government to adopt innovative, free trade zones for tax-free projects, technology parks and incubators, are tremendously stimulating the growth of the sector. Projects like Silicon Valley, Dubai Internet City, Dubai Silicon Oasis and others provide a strategic market for international community of ICT companies to supply the UAE market needs as well as to target markets in the Middle East, Africa, Central Asia and the Indian subcontinent. Nevertheless, there is an absence of national and international references that offer reliable data regarding the significant levels of production for either hardware or software.

Keeping the advancement in this sector in mind, there are three restrictive factors that need to be considered:

First, most IT development initiatives in the UAE are located in Dubai. “Dubai Internet City” DIC, an information technology park, consists of over 1000 information and communications technology companies (DIC website http://www.dubaiinternetcity.com/), including major international software companies like Microsoft, Oracle, HP, IBM, Dell, Siemens, and Cisco. In addition, projects like Dubai Silicon Valley and Dubai Silicon Oasis are also located in Dubai. This enormous technological hub is resulting in a digital divide between Dubai and the other emirates of the country.

Second, encouraging development in the sector is not really addressing local companies; the ICT sector is mostly led by multinational companies that service the region. “The government encouraged the implementation of subsidiaries of foreign companies to service the region and not really by addressing the issue of creation and development of local [Small and Medium Enterprises] SME’s for the sector” (Aita, 2006, p.25). The need to involve local SMEs and local human capacity in the development of the sector would have more impact on the economy and contribute in good share of GDP by creating jobs, developing national labour capacity and increasing exports.

Third, the implemented projects rarely assess the sufficiency of national human resources (nationals) to meet the demands of the ICT growth. This led some to argue that “the emirate- and UAE-level, institutional capacities for a rapid expansion of skills training or high-skill graduate output are
either lacking or at an early stage of development” (Keivani, 2003, p.41). Although the government is encouraging citizens to pursue higher education, specifically training in engineering and information technology, the IT labour market is still composed mainly of expatriates who constitute almost 90% of the workforce (Wilkins, 2001).

To absorb the rapid increase in the demand for ICT products and services, it is essential to encourage local SME companies. Aita suggested improving the regulatory environment and facilitating the performance by providing financial facilities at the national level. We would suggest extra facilities for the northern emirates to reduce the divide and encourage the industry all over the country. At the same time, providing access to ICT companies at a less expensive service rates, encouraging ICT communities and fostering new industries and services like medical services, lifestyles in an IT environment all over the country will help reducing the divide and foster adoption.

On the other hand, developing national expertise to improve competitiveness in the international market will help the UAE move forward in utilizing ICT and competing with other countries in this domain. After all, the availability of skilled local workers and accessibility to reliable high bandwidth infrastructure are key components to the development of a domestic ICT sector (World Bank, 2005).

**E-Government**

E-Government refers mostly to government’s use of ICT to exchange information and services with citizens, businesses, and other arms of government (Wikipedia, 2007). It incorporates a set of reflexive interactions: government to government (G2G), government to business (G2B), and government to citizen (G2C).

Shifting to electronic governance implies a change to how the government operates and new responsibilities for better public services and engagements. Eventually, “political commitment to harnessing the benefits of ICTs, a well thought-out vision, and do-able objectives are important markers for successful e-government development” (UN, 2005, p.12).

The UAE government has made it to the top rankings. It is ranked highest in e-government readiness (0.5718) among all Arab countries, by the United Nations West Asia e-government ranking (2005) and third between all ESCWA regions (2005). It advanced its ranking tremendously from 60 in 2004 to 42 in 2005. It is ranked 32nd in e-government readiness index among the 192 member states in the fourth-edition of the e-Government survey conducted by United Nations Department of Economic and Social Affairs (UNDESA, 2008).

According to the same World Bank report, all UAE ministries have interactive on-line presence through the government official federal portal http://www.government.ae. It is published in both English and Arabic languages, and grants access to all government ministries through a unique point of access, thus providing easy access to both information and services to the public. It is organized by end users: nationals, residents, businesses, visitors, and government. The same portal provides access to two other portals: the e-Dirham portal, http://www.e-dirham.gov.ae; and the e-Forms portal, http://www.uaesmartforms.com. Many online interactive services are available like ePay, askDubai, mDubai, eJob, and eCitizens which include help for users in getting training programmes, paying of electricity and telephony bill online, reporting a damaged driver's license or lost driver's license, inquiring about values of traffic violations and others.
Transforming from traditional government into e-government involves improvement of services and acceleration of governmental policies to match the rapid change. Implementation of e-government in a nation requires the “ABCDE” prerequisites defined by the World Bank (2005) for the citizens to get involved and for the government to be engaged:

- Access or ability and affordability of citizens to access technology in terms of equipment and costs
- Basic skills or availability of basic knowledge of technology use
- Content that is valuable and interesting to both government and citizens
- Desire and willingness for leadership and reform
- Engagement and commitment of civil society as well as its awareness for development

To reach higher levels of citizens’ participation in all departments, strenuous action needs to be taken by the government. To help in planning for such a change, lessons could be learned from success stories in other countries. The Singaporean government initiatives: The CitizenConnect, Mobile Government and The Enterprise Challenge, for example, created some interesting services to enhance G2C and encourage C2G online interaction by:

- Setting online connection centers in nearby locations accessible to residents. Centers were equipped with personal computers with Internet access and online payment peripherals. Appointed officers offer help and guidance to public
- Personalizing information which enables the user to receive personal e-mail and SMS alerts
- Offering weekly and monthly prize draws to encourage residents to make online payments
- Providing funding to test innovative ideas that have the potential to improve how public services are delivered (Singapore Government, 2008)

Such services will definitely motivate citizens to access use and technology, save their time and reduce their costs.

On the other hand, the UAE e-government strategy facilitates collaboration at the federal level; it allows sharing and distributing data between different federal entities, and maximizes internal operational efficiency. The portal also allows government to business services and interactions. Project like Tejari was initiated to work more effectively with businesses as suppliers of goods and services; sellers and service providers can access and download information such as forms, tenders to participate in online directory. G2B interactions will be discussed later in this paper.

**E-Education**

Education is a fundamental component for economic growth. The introduction of ICT to schools creates new possibilities for learners and teachers to engage in new ways of teaching and learning. It has the potential to enhance the management and administrative capacity of schools as well. The integration of ICT in education requires significant investments, effective training, considerable support efforts, and clear strategies.

The UAE “has witnessed a paradigmatic learning shift from traditional classroom to virtual one in which the learners are actively engaged in their own learning process. This shifting has strongly been supported by generous investments in the online educational sector and related activities” (Taha, 2006, p.352). E-learning technology, defined as the use of technology in learning and teaching, is becoming more visible in private than public schools in the UAE; computer skills are being taught at
elementary, intermediate and secondary levels as planned by the IT Education Project. The investment in E-learning delivery in schools in UAE takes about 45% of the market share (ESCWA, 2005); and was driven by the necessity to meet the challenge of global educational standards and the information technology age.

In a response to the high tech hub, universities’ efforts in implementing online education programs are also significant. Content management systems are being adopted by almost all universities to support the learning process and many programs are offered virtually to provide more learning opportunities. The “Knowledge Village”, a project that aims to “position the Middle East as a center of excellence for learning and innovation” (Knowledge Village website, 2007), and particularly the emirate of Dubai forms the foundation for delivery of e-learning services.

It is evident that the stage seems to be set for rapid advances in learning. In the UAE, educational institutions are technology–rich environments, all schools and libraries are technologically well equipped and students and teachers are granted free internet access. However, there are still some major concerns within the primary and secondary education sectors and school management (Hanouz & Youssef, 2007). There is a growing international awareness that networked readiness in the educational arena is the result of multiple attributes, technology integration being one of them. It is also influenced by a variety of factors that might enhance or limit its use. Those factors include political influence, funding, school policies and strategies, access, teacher development, administration support, parents’ awareness, and curriculum reform.

Most importantly, the absence of a planned strategy at the national and institutional level results in a chaotic way of implementing initiatives with no pre-designed objectives to achieve. In their survey Muysken & Noor (2006) pointed out that the deficiency of the educational system in the UAE is hardly recognized and less documented. Deficiency in the system may be due to inadequate planning, monitoring, and assessment of educational needs, especially that implemented changes were not based on an adequate assessment of the adopted system and evaluation of alternative changes.

Schoepp (2005) stressed that perceived barriers to technology integration in a “technology-rich environment” were: uncertainty regarding how to effectively integrate technology, unrecognized efforts for those utilizing technology, unavailability of standards for teaching with technology and lack of sufficient technology training. Poor administrative support; time management, space, supervision, teachers and parents’ attitudes towards and knowledge about computers are also factors that needed to be taken into consideration.

However, the most critical success factors in education do not lie in the technology used per se, but rather in the carefully planned strategies and new teaching approaches supported by the application of technology to enhance education and improve quality and effectiveness of teaching and learning.

“The assumption that computers by themselves will improve the learning process has become endemic among decision makers in education and other areas. One of the misconceptions of how computers can help learning stems from an insistence that the same skills that we have been taught for the past century remain the most important and relevant in today’s Networked World” (Kirkman, Cornelius, Sachs & Schwa, 2002, p.14).

As such, and similar to technological integration in educational contexts around the world, there is a pressing need to find appropriate pedagogical approaches for technology integration to enhance education
and improve the quality and effectiveness of the learning process. There is also a more urgent need to modify teaching approaches into more meaningful ones. Appropriate strategies are needed to help improve the educational sector to reach the same level of other sectors’ competitiveness. One solution may lie in the consideration of an academic reform that addresses the curricula at different grade levels, including primary, intermediate, and secondary education. This should be done while keeping the national and international changes in education that have resulted from the advancement of technology.

A well planned, ongoing professional development program, tied to the curriculum goals and sustained by new models of teaching to match the digital age, will also be helpful. More emphasis should be placed on meaningful instructional strategies, and the development of student centered learning environments which need a high level of training, educational leadership, and a high level of commitment. Other suggestions are also voiced by other researchers. For example, Schoepp (2005) stressed that a major challenge, at the moment, lies in how to integrate technology within curriculum properly and effectively and recommended technology integration plans. We also believe that educators should have technological skills to support instruction in order to implement it properly in classroom practice. However, effective integration plans should be in harmony with systematic approaches for successful implementation. They should go beyond computer skills and operation, practice, and tutorial software to ways of integration into specific subjects matter in order to develop technology-based learning activities. Schoepp also suggested establishing standards for computer technology and its application in education. One may be able to learn a lot from success stories around the world such as the Australian experience. A good example is the Teacher Learning Competencies which is a project launched by the Australian Council for Computers in Education (ACFCE, 2000) to improve the knowledge, skills, and attitudes of teachers regarding the integration of technology into classroom practices. Standards of technology training for teachers included: IT skills; curriculum applications and classroom management and planning, school planning and student centered learning. UAE policy makers may develop appropriate standards that are in harmony with the local needs, regulations and cultural environment.

Another suggestion is the need for collaboration between schools and academia to provide support from researchers and university professionals in order to make the best out of evidence based practices. In a collaborative action research Harwell, Gunter, Montgomery, Shelton, & West (2001) studied a cooperative partnership between a regional university and local school teachers on using learning environments research to monitor alignment of classroom learning activities with a constructivist viewpoint while integrating technology into the curriculum. As a result teachers “became more competent and confident in technology use and more knowledgeable about the constructivist viewpoint of teaching and learning, teachers became more committed to modification of more of their instructional practices” (p.283). Moreover, educational institutions should ensure that new education graduates possess the necessary technology skills as well as appropriate methodologies for proper technology integration.

Technology integration within educational institutions is a way to improve its adoption in the community as a whole. Teachers and administrators should recognize and become aware of the advantages of technology and its ability to impact the competitiveness of the country as a whole. They also need to
understand the relationship between school activities and programs, and state and national goals. Finally, further researches are tremendously needed to know the applicability of strategies being researched abroad on the actual emeratian classroom setting.

**E-Health**

The combined use of electronic communication and information technology applications in the health sector encompasses a range of services like electronic medical reports, telemedicine, consumers’ health informatics, and health knowledge management. Modernization of the healthcare system in a nation may promote more citizen-oriented services, improve quality and services at reduced costs and offer national data for health systems management.

E-health applications, to modernize the nation's health-care system, are still at the initiative stages in the UAE. Recently it is being implemented in both private and public sectors for management and diagnosis only. For example, the E-service provided by The Department of Health and Medical Services (DOHMS) web site covers only health card renewals.

In August 2007, the ministry of health announced a new strategy for the next three years that aims to ensure medical services to all UAE nationals and residents. The initiatives include building an electronic network connecting hospitals and healthcare centers in the UAE, a medical archiving system, and a national health database. It will incorporate a national electronic health record system that documents all individuals’ relevant interactions with the health care system like physicians, pharmacists, hospitals or labs. Citizens will have an e-health card that tracks their medical life history while the electronic record will be available to health care professionals anywhere in the country. An interesting evaluation process to notice is that key performance indicators (KPI) were identified to track the project's progress (Muslim, 2007). In October 2008, the ministry selected a leading US supplier of health information technology to automate the process (Kansas City Business Journal, 2008). However, the use of emerging information and communication technology in the health field involves all the stakeholders: policymakers, health care organizations and providers, health professionals, and citizens. Reaching the value stage of the technology with the availability of application is when all players access and use technology to seek support and advice from peers or professionals, manage a chronic condition, decide on treatment regimens or consult a health care provider.

This initiative would be highly supported by launching a health information portal, particularly if backed up by the ministry of health targeting the UAE citizens and health professionals. This portal would offer health information and education as well as health related services provided by hospitals, doctors, pharmacies etc. E-health education is an essential issue that plays a crucial role in the development of a healthy society. Health related websites in native language help in resolving and preventing health problems and spread awareness among the population.

Citizens seeking medical or health related information, develop a clearer understanding of their health problems and increase quality of their interaction with their doctor. The portal can also support electronic messages that are exchanged between health providers like referrals, discharge letters, etc.

The Dubai Health Care City (DHCC) is considered a phenomenal environment of health clusters that attracts international high-quality healthcare, medical education, research and pharmaceuticals such as Harvard medical school and Mayo Clinic. The DHCC, with a vision to “become an internationally recognize location of choice for quality health
care” (DHCC, 2008), has great potential to improve the quality of health care in the UAE in general and in Dubai in particular. On the other hand, Abu Dhabi successfully attracted Cleveland Clinic and John Hopkins Hospital (Sheeran, 2006). The health sector is set for improvement; there is a great opportunity for leadership in the country. Out of those projects comes a set of challenges, not only the attraction of investment but also the stimulation of the research environment that is lacking in the sector.

**E-Commerce and Business**

The dot com bubble had a great impact on online business and commerce around the world. It triggered a change in the way transactions are being made and redesigned the business process. While e-business depends on the use of ICT to support business activities, e-commerce refers to electronic transactions between different businesses, business-to-consumer, business-to-government, government-to-government, and government-to-consumer. From a commercial perspective, the World Wide Web is a 24/7 worldwide business and shopping center that provides a wide variety of information and products to shoppers and clients in a set of diverse and dispersed enterprises. “The purpose of merging commerce and internet is to benefit of unique business opportunities driven by the prospect of world wide exposure” (Mougayar, 1998). Business enterprises, financial institutions and the government are considered main drivers of the e-commerce the UAE, their adoption as well as consumers’ adoption of technology foster the sector’s development.

The government focused its ICT integration efforts on creating an enabling environment for e-commerce. It built the first business-to-business (B2B) online marketplace in the Middle East: “The Tejari” (http://uae.tejari.com/) a unique project that allows companies to buy and sell goods and services online. The Dinar Standard online magazine revealed that in 2006, Tejari had more than $1.3 billion worth of business transacted through it, marking a 33% rise in trading volume. Transactions involved twelve nations across the Middle East, South Asia, and North Africa (Shikoh, 2007). They were conducted mostly by multinational companies established in the free zones. The UAE is one of only three Middle Eastern countries to provide a legal framework for electronic transaction and e-commerce. The other two are Bahrain and Jordan.

“The principal drivers for B2B e-commerce [in the Middle East] are multinationals that require distributors and agents to use online channels. The second major factors encouraging e-commerce are local and federal governments moving increasing amounts of tender offer and payment activities online”(Dutta, Shalhoub & Samuels, 2007).

Even though, The ESCWA report (2005) on UAE pointed out that registered domains under the national country code have increased from 48,000 in 2003 to 56,1694 in 2005, Small and Medium Enterprises (SME) need development for new ways of engaging in the high tech hub to take full advantage of the rapidly changing technology for marketing goods and spreading awareness and knowledge of e-commerce and business benefits. E-business is favourable for SMEs because it reduces costs and eliminates the constraints of distance. Major barriers to the adoption of B2B by this kind of enterprises are:

- Their incapacity to supply the regional and global market
- The traditional business culture in the area that relies on strong personal relationships (UN E-commerce and Development Report, 2002)
- The preference for personal face-to-face communications over e-mails. Usually, small companies have a small number of customers; they prefer a
stronger face to face customer interaction for persuasion and negotiation

- The IT development cost

Major drivers for e-commerce development identified by the Global E-Commerce Survey (UN, 2002) were: the customers demand for online transactions, online competitors and reduced costs. A suggestion to progress the sector is to involve all concerned parties including small and medium enterprises as well as consumers. Other suggestions include:

- Promoting online business marketing through advertising to encourage online purchases opportunities, by offering exclusive variety and special online discount rates
- Protecting consumers where companies should assure consumers’ security and confidentiality, using methods such as encryption, timed log outs and firewalls. The UN commission revealed ( Dutta, Shalhoub & Samuels, 2007) that no Middle Eastern country is in the process of developing regulations and laws regarding consumer privacy and security over the internet
- Encouraging online business and imposing e-procurement to push companies to go on-line in order to serve government agencies
- Encouraging SME active presence online. Technology adoption is not limited to large companies which logically have a higher utilization of different kinds of technologies
- Encouraging integration of internet and intranet in SME daily processes and systems in order to contribute to the overall development process by providing the necessary technical support

Regardless of all what is being said and done, an important question that needs to be asked is whether the consumers are ready for technology adoption.

Operations conducted online reflect modest commercial transactional activities, especially when it comes to online banking. Only 13 banks (out of 46) offer e-banking services and 18 percent of bank clients use e-banking channels for transacting financial services (ESCWA, 2005).

However, consumers to business (C2B) online interactions’ did not embrace the new technology yet. There are a range of barriers for consumers in engaging with e-commerce. According to Kshetri these barriers may be grouped into three categories: economic, sociopolitical and cognitive (Kshetri, 2007)

**Economy**

- Low use of credit cards: According to the Madar Research Group (as cited in ESCWA, 2005), the total payment cards in circulation is about 2.1 million both debit and credit, representing a density of 52.5 cards per 100 inhabitants by end 2003 with the possibility of the individual inhabitant to hold more than one credit or debit card
- Limited choice of local products or services and poor logistics and fulfillment service for online purchased items

**Cognitive**

- Computer illiteracy and lack of English language skills
- Lack of knowledge about the rules and regulations of electronic trades

**Sociopolitical**

- On an individual bases, there is a preference for and easy access for personal or face-to-face purchases. The enormous variety of up-to-date enterprises and showrooms present in
shopping malls reduces incentive for online shopping

- Lack of trust and reliability in the service provider. Costumers do not trust online banking transactions nor purchasing goods and services from online websites
- Fear from identity theft

Arabic Content

Arabic, the 4th language spoken by 452 million native speakers in the world, has unfortunately made very slow steps on the digital information landscape. Investments in digital technology are more generous regarding infrastructure and devices rather than Digital Arabic Content (DAC).

Dutta, Shalhoub & Samuels (2007) reported that:

“The scarcity of Arabic digital content on the Web further diminishes the average user’s perceived need to acquire a computer. While the world’s Arabic speakers number 300 million, Arabic Web pages represented only 0.2 percent of total Web pages in 2006, or an estimated 100 million pages compared with approximately 40 billion pages in all other languages. By contrast, Korean Web pages account for 4.4 percent of the Web’s content, although Korea has a population of 45 million” (p.85).

Most Arabic online websites and forums consist of religious and cultural information, news and entertainment (Aita, 2006). Educational bibliographic databases of journal articles and reports are rare or even unidentified. The paucity of scientific, educational and literature productivity in the Arab region is another reason that aggravates the situation. Dutta and Coury stress that the creation of Arabic content is central to the robust development of ICT in the Arab world (2002).

In an era that places increasing value on information and knowledge; major initiatives should be taken to satisfy the region’s population needs for the intellectual and economic development of the Arab world and bring Arabic native speakers together. Al-Khalifa & Davis (2005) pointed out the need for an Arabic application profile “to bridge the gap between the Arab countries and others in the field of learning technologies” (p.5).

According to the same authors, it is crucial for Arab policy makers to fulfill the functional requirements of the Arabic community and their language to have an Arabic tailored set of metadata elements. However, this is a challenge that is not only related to the advancement of technology. Even before the expansion of the World Wide Web, the level of Arabic scholarly publications was minimal compared to the global contribution in other languages due to the scarcity of Arabic academic journals. Nevertheless, the need also necessitates a regional strategy that is built on educational research and information to establish a solid platform to build over in all Arabic speaking countries. The ESCWA initiative to launch a series of Digital Arabic Competitions in Western Asia to promote the Digital Arabic Content (DAC) industry may enhance the opportunity to resolve technical issues related to the production of DAC and increase investment in the industry. The competitions targeted entrepreneurs and university graduates who wish to implement their ideas into viable projects (ESCWA, 2008).

Recently, initial steps are being implemented in the nation by digitalizing and improving access and retrieval processes for Arabic bibliographic data in libraries mainly Dubai Municipality and the UAE’s national university (UAEU) libraries. The UAE is being dynamic in contributing to the development and enhancement of DAC by:
1. Adopting Arabic Content web pages: first, through the government portal and web applications that are available in both languages Arabic and English and are the result of an effort for the development of Arabic content.

2. Encouraging technology parks and incubators to create Arabic software products. This futuristic step will contribute largely in the development of Arabic content.

3. Encouraging research and publications, Keivani, Parsa & Younis (2003) pointed out at the number of papers published in refereed international journals from UAE universities has increased from one paper in the 1970-1975 period to 579 papers in the 1990-1995 period, while the whole Arab world contribution is only 1.7 percent of the scientific journals output.

4. Creating the Arabization center to build an up-to-date e-Arabic library. The center of Arabization and program integrity is an exceptional example to follow.

Still, many actions are to be taken and require the government support, recommended ones include:

- Establish policies, standards and centers for Arabization, and contextualization which will definitely enrich libraries with a mix of intellectual, academic, professional, and developmental Arabic script records databases.
- Encourage publishing research, journal articles, books, conference papers and other education-related materials in Arabic language.
- Allocate research budgets and funds
- Favor companies and universities that develop “arabization” using Arab human resources and researchers (Dutta, & Coury, 2002)
- Create repositories and databases for archiving educational learning resources and objects
- Support Arabic education content websites
- Encourage Arabic online collaborative environment and open sources learning initiatives
Conclusion

Based upon readiness described in the previous sections, the analysis of different sectors illustrates that the country made considerably huge efforts to incorporate technology into all its vital sectors. The UAE—and particularly Dubai—has embarked on the readiness highway, through rapidly developing its ICT infrastructure, e-government capability, e-commerce transactions and multiple free zones initiatives. It is now the most advanced country in the Middle East. The country competes successfully on a global level particularly Dubai. However, the nation is still facing diverse challenges. The paper offered suggestions regarding aspects that may help in making the transition more effective and efficient.

Designing a clear strategy by the government and policy makers for making the best out of the technology will be highly influential in establishing the country as a competing force in the 21st century’s international platform and minimizing the digital divide between the different Emirates. Moreover, engaging the citizens in the process of technology adoption will make the country’s transition to the technological century smoother and faster, particularly with regards to education and health. Finally, collaboration between researchers, educators, and policy makers is highly needed to allow for the development of all sectors according to local needs and requirements and international standards. The importance of developing an indigenous Digital Arabic Content is a key driver to increase public participation and social development.
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Online Learning Models: The Significance of Collaboration

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Introduction

As the acceptance and enrolment in online education programs goes up, it becomes increasingly important for the academic community involved to focus on the factors which make for a better online learning experience for the student. A better experience would be defined as one which is effective i.e. one which helps the student learn, and also one which keeps the student involved and interested in the education.

As the most successful online University in the world, the University of Phoenix can potentially offer important lessons to the online education community worldwide. While operating in the US context, and largely with adult learners, I still believe a closer look at the Model as a case study offers some interesting insights for Universities operating in other cultural contexts, and possibly with different student profiles.

Background

To dig deeper into the success factors of online Higher-education, it is important to take a look at the genesis of online Universities in general. Broadly, these can be divided into the following categories:

- The dot coms - new entities created in the dot.com era and after: E.g. Capella, U21 Global, Open University Malaysia etc.
- Traditional educators who moved online: UMUC, University of Liverpool, Kelley School etc.
- Distance / part time educators who moved online: University of Phoenix, Indira Gandhi National Open University etc.

The genesis can be significant because schools traditionally teaching remotely have a better understanding of the distance learner and what it takes to keep them engaged and make them successful. Of course, some dot.coms do a great job while some distance educators have not adapted to the web as successfully. A wide range of factors impact the final shape and form of such a program – these include the willingness to learn from others, the limitations placed by budgets, internet penetration and student access, student maturity etc.

University of Phoenix was created specifically to focus on the needs of the adult learner. When University of Phoenix was founded more than three decades ago, the leading edge of the US Baby Boom generation was just turning 30 and the first personal computers were introduced. It was in this context that Dr. John Sperling, a Cambridge-educated economist and professor-turned-entrepreneur, anticipated the confluence of technological, economic and demographic forces that would herald the return of working adults to higher education. He saw a growing need for institutions that were sensitive to and designed around the learning characteristics and life situations of the working adult population. He therefore set up two institutions – The Institute for Professional Development (IPD) followed by the University of Phoenix (UoP). The first was an organization which helped educational institutions create and implement effective programs for working adults. The second was
to directly enroll adults and deliver an education to them.

When the internet came along, the University of Phoenix already had multiple physical locations spread across the US. The University offered its first online program in 1989.

Other institutions have succeeded in the area of online learning, as much by learning from successful models elsewhere as from devising their own models – specific to their learner profile, their regulatory environments, and the socio-cultural aspects which govern any such program.

This paper first profiles UOP, then talks about the Andragogical model followed at UOP and some of the academic outcomes reported by UOP, and finally does a high level comparison with what is often prevalent in other on-line Universities.

The UOP Model

A brief description of the UOP model is probably a good place to start. Please note that the information provided here relates to the University of Phoenix students, and not Axia College. Axia is a college under the university which offers associate level education, and caters to a very different student profile. For this specific student Axia follows a different and more directive model.

UOP is an open admission university i.e. it accepts all students who meet the criteria of prior education and experience required for admission into a particular program. It is not elitist – in fact it is almost the opposite of that with a focus on inclusive education. This is because it functions on the basic belief that everyone who seeks higher education should have access to it.

The University of Phoenix essentially caters to working adults. The average age of a University of Phoenix student is between 33 (undergraduate) and 36 (graduate), and most students have work related commitments. A quick snapshot of the University in Numbers:

- 2008 Total enrolments: 360,000 +
- 2008 Online enrolments: 200,000 +
- 1996 online enrolments: 2000
- Faculty: 22,000 +
- Number of learning Centers: 231 (15 outside the US)

The student also receives a lot of support in the area of enrolment, transcript evaluation, financial aid, academic issues and so on from the University. The idea is basically to minimize the effort and time spent by the student on administrative tasks, so that he/she can focus on the learning itself.

The UOP Andragogical model

Deriving from the above philosophy, the Andragogical model itself was built around the adult learner and her/his needs.

All students are organized into classrooms, and each class has a practitioner faculty (called the facilitator) who manages and moderates the class. The faculty is selected based on the accreditation requirements of the HLC North Central Associations norms which are amongst the highest accreditation body in the US.

The key elements of this model are:

- Small class size
- Shorter duration courses (typically one at a time)
- High interaction levels in class
- Standardization of content and curriculum

The University of Phoenix model was developed well before the advent of the internet with a strong belief in peer-to-peer learning. UOP recognizes that adults learn differently, and can add a lot of value to the classroom - so the learning is as much from each other as it is from the faculty – which is why the faculty is often referred to as the facilitator. More importantly, UOP recognizes that once organized into a community, humans stay more committed and motivated
because of their commitment not just to themselves or their employer, but also to the learning community of which they are now an integral part.

A small class size and collaborative learning have therefore been the hallmark of a University of Phoenix education. Irrespective of the modality (online or on-ground) teamwork and collaboration are requirements from day one and compel students to work not just with their own expectations, but also the expectations of other team members – thus providing important peer support and key competencies required in almost any field of endeavor. Courses are designed to combine individual and group activities and require interaction, discussion and debate among students and faculty. Team learning at all academic levels helps teach students how to lead and how to follow, provides a safe place to try out new ideas, and facilitates collaborative behaviors important to learning and work. These goals cannot be accomplished in large lecture halls; therefore the average class size is maintained to fewer than twenty students.

As a US accredited University, The UOP model follows the broader academic system of the US wherein each program is made up of courses, and each course is a certain number of credit hours. The student also has elective options.

The typical class is 5 or 6 weeks in duration. The student is provided a very well structured schedule for the entire course, including weekly requirements which typically include required reading, discussion group participation requirements, individual assignments, team assignments and so on.

Content is provided in the form of eBooks, online content and articles from the UOP online library which includes publisher content and also content from many off-the-shelf online content libraries such as NETg. Further, sophisticated multiple-path simulations specifically focusing on more complex topics / topics with more applied aspects are made available to the student. These standalone single player simulations created to provide deeper insight into specific topics, and are also often discussion topics in the online forums.

The central content and resource provides access to various forms of content and support which include:

- eBook Collection
- Simulations
- Virtual Organizations
- Center for Writing Excellence
  - WritePoint
  - Plagiarism Checker
  - Tutor Review
  - Dissertation Services
- Center for Mathematics Excellence
  - Running Start
  - Online Tutoring
  - Self-Assessments
- University Library

The collaborative elements in the class, and some of the tools used in the classroom are:

- Initial introductions and team formation
- Creating a learning team charter
- Defining expectations and goals for teams in terms of assignments and activities
- Establishing team processes and communication channels
- The learning team reports and feedback.

The class starts with all members of the class sharing a bio with the rest of the class. The Bio is posted in the “chat room” – the equivalent of a hangout place where the conversation is informal and the students have their own space, so they can interact more casually and get to know each other. This helps them establish commonalities and understand the background and experience of each of the learners. Since the class is small,
the students getting a good sense of each other is not difficult, especially since the students are mostly enrolled in only one course at a time. Typically within the first week itself the class is also distributed into teams. The team activities and assignments are defined clearly in the syllabus, which is made available on day one, and contains all details such as the grading structure and breakdown and the team activities and assignments. This helps the student understand clearly the importance of the team activities for his / her grade.
Once the teams are announced the team members are then expected to create a learning team charter, which helps establish a commonality of goal and purpose. This is a document which is created by the team itself, and requires a signoff from every member of the team. This is a step towards getting the entire team to agree on a certain set of performance expectations and quality standards. While a template / format may be provided by the University, it is important that the team creates their unique charter themselves.
The internal processes and communication within the team are not dictated by the University. Teams choose different ways of working together – some using voice communication or skype and phone meetings extensively, while others use the asynchronous communication within the discussion forum. In case of significant offline interaction, the University asks that the group post the key extracts of the various team interactions / email these to the facilitator.
The discussion group is the centerpiece of the class, where an ongoing conversation about the various topics being covered at that point continues between the students. The facilitator brings in a lot of depth and insight into the discussion. Besides having a strong academic background of the subject, the instructor brings in significant practical knowledge. The student is required to participate in a substantial manner 4 or 5 days a week depending upon the program.

The Outcomes of UOP
UOP has been a controversial institution in the US, sometimes looked down upon by traditional academia because of its non-traditional nature. Earlier this year the University of Phoenix came out with an annual academic report which takes information from two neutral surveys to measure the effectiveness of education. These indicate a strong academic performance by the University of Phoenix, at par and often better than that of traditional educational institutions.
The two measurement basis: Measure of Academic Proficiency and Progress (MAPP) and the Standardized Assessment of Information Literacy Skills (SAILS).

MAPP
In a nutshell, MAPP is:
- Nationally-normed assessment
- Developed by Educational Testing Service (ETS)
- Assesses undergraduate critical thinking, reading, writing, and mathematics skills
- 2007 – First year MAPP available to both online and ground students
- Student participation was opt-in for first year; not mandatory
- UPX students opted in – participation not mandatory

The MAPP study essentially covers one universe, and three subsets of it:
1. All institutions
2. Specialized institutions
3. MastersUniversities and Colleges
4. UOP students

Some of the highlights are tabulated below:
Table 1: MAPP Summary

<table>
<thead>
<tr>
<th></th>
<th>UPX Seniors n = 791</th>
<th>All Institutions Seniors n = 127,679</th>
<th>Specialized Institutions Seniors n = 5,389</th>
<th>Master's Universities &amp; Colleges Seniors n = 48,433</th>
</tr>
</thead>
<tbody>
<tr>
<td>Critical Thinking</td>
<td>112.13</td>
<td>112.09</td>
<td>111.83</td>
<td>112.08</td>
</tr>
<tr>
<td>Reading</td>
<td>119.27</td>
<td>119.72</td>
<td>119.40</td>
<td>119.81</td>
</tr>
<tr>
<td>Writing</td>
<td>114.47</td>
<td>115.21</td>
<td>114.89</td>
<td>115.37</td>
</tr>
<tr>
<td>Mathematics</td>
<td>112.65</td>
<td>115.21</td>
<td>114.06</td>
<td>114.58</td>
</tr>
<tr>
<td>Humanities</td>
<td>116.71</td>
<td>115.89</td>
<td>115.67</td>
<td>115.86</td>
</tr>
<tr>
<td>Social Sciences</td>
<td>114.58</td>
<td>114.50</td>
<td>114.33</td>
<td>114.48</td>
</tr>
<tr>
<td>Natural Sciences</td>
<td>115.95</td>
<td>115.82</td>
<td>115.53</td>
<td>115.94</td>
</tr>
</tbody>
</table>

While the above results indicate that UOP students are in general at par with the students from the bulk of the system, the more interesting fact is UOP students often start at a lower level of proficiency and so demonstrate a higher level of learning than their counterparts from other institutions. This is illustrated in the charts below:

![Fig 1: Freshmen Vs Seniors: Critical Thinking](chart.png)
Fig 2: Freshmen Vs Seniors: Writing score

<table>
<thead>
<tr>
<th>Institution Type</th>
<th>Freshmen</th>
<th>Seniors</th>
</tr>
</thead>
<tbody>
<tr>
<td>UPX</td>
<td>112.22</td>
<td>114.47</td>
</tr>
<tr>
<td>All Institutions</td>
<td>113.74</td>
<td>115.21</td>
</tr>
<tr>
<td>Specialize Institutions</td>
<td>113.14</td>
<td>114.89</td>
</tr>
<tr>
<td>Master's Institutions</td>
<td>113.26</td>
<td>115.37</td>
</tr>
</tbody>
</table>

Fig 3: Freshmen Vs Seniors: Math score

<table>
<thead>
<tr>
<th>Institution Type</th>
<th>Freshmen</th>
<th>Seniors</th>
</tr>
</thead>
<tbody>
<tr>
<td>UPX</td>
<td>109.47</td>
<td>112.65</td>
</tr>
<tr>
<td>All Institutions</td>
<td>113.04</td>
<td>114.43</td>
</tr>
<tr>
<td>Specialize Institutions</td>
<td>112.03</td>
<td>114.06</td>
</tr>
<tr>
<td>Master's Institutions</td>
<td>112.18</td>
<td>114.58</td>
</tr>
</tbody>
</table>
**SAILS**

In a nutshell, SAILS is

- 40-item standardized assessment
- Multiple choice
- Measures undergraduate information literacy skills
- Specifically assesses the following skill sets:
  - Developing a Research Strategy
  - Selecting Finding Tools
  - Searching
  - Using Finding Tools Features
  - Retrieving Sources
  - Evaluating Sources
  - Documenting Sources
  - Understanding Economic, Legal, and Social Issues

---

**Fig 4: Freshmen Vs Seniors: Reading score**

<table>
<thead>
<tr>
<th></th>
<th>Freshmen</th>
<th>Seniors</th>
</tr>
</thead>
<tbody>
<tr>
<td>UPX</td>
<td>116.45</td>
<td>119.27</td>
</tr>
<tr>
<td>All Institutions</td>
<td>117.2</td>
<td>119.72</td>
</tr>
<tr>
<td>Specialize Institutions</td>
<td>116.07</td>
<td>119.4</td>
</tr>
<tr>
<td>Master's Institutions</td>
<td>116.5</td>
<td>113.81</td>
</tr>
</tbody>
</table>
### Table 2: UOP Vs all institutions participating in SAILS

<table>
<thead>
<tr>
<th>Skill Set</th>
<th>UPX N=1,170</th>
<th>Other N=39,640</th>
</tr>
</thead>
<tbody>
<tr>
<td>Developing a Research Strategy</td>
<td>580</td>
<td>582</td>
</tr>
<tr>
<td>Selecting Finding Tools</td>
<td>560</td>
<td>558</td>
</tr>
<tr>
<td>Searching</td>
<td>560</td>
<td>552</td>
</tr>
<tr>
<td>Using Finding Tool Features</td>
<td>640</td>
<td>637</td>
</tr>
<tr>
<td>Retrieving Sources</td>
<td>571</td>
<td>573</td>
</tr>
<tr>
<td>Evaluating Sources*</td>
<td>605</td>
<td>589</td>
</tr>
<tr>
<td>Documenting Sources*</td>
<td>574</td>
<td>590</td>
</tr>
<tr>
<td>Understanding Economic, Legal, and Social Issues*</td>
<td>566</td>
<td>559</td>
</tr>
</tbody>
</table>

Note: significant difference between means (p<0.05)

### Table 3: UOP Vs all Master institutions participating in SAILS

<table>
<thead>
<tr>
<th>Skill Set</th>
<th>UPX N=1,170</th>
<th>Other N=6,749</th>
</tr>
</thead>
<tbody>
<tr>
<td>Developing a Research Strategy</td>
<td>580</td>
<td>577</td>
</tr>
<tr>
<td>Selecting Finding Tools</td>
<td>560</td>
<td>556</td>
</tr>
<tr>
<td>Searching</td>
<td>560</td>
<td>549</td>
</tr>
<tr>
<td>Using Finding Tool Features</td>
<td>640</td>
<td>634</td>
</tr>
<tr>
<td>Retrieving Sources</td>
<td>571</td>
<td>572</td>
</tr>
<tr>
<td>Evaluating Sources</td>
<td>605</td>
<td>587</td>
</tr>
<tr>
<td>Documenting Sources</td>
<td>574</td>
<td>581</td>
</tr>
<tr>
<td>Understanding Economic, Legal, and Social Issues</td>
<td>566</td>
<td>555</td>
</tr>
</tbody>
</table>

Note: significant difference between means (p<0.05)
Table 4: A comparison between UOP online and on-ground students:

<table>
<thead>
<tr>
<th>Skill Set</th>
<th>1-25% courses online n=353</th>
<th>100% online n=634</th>
</tr>
</thead>
<tbody>
<tr>
<td>Developing a Research Strategy</td>
<td>569</td>
<td>586</td>
</tr>
<tr>
<td>Selecting Finding Tools</td>
<td>550</td>
<td>570</td>
</tr>
<tr>
<td>Searching</td>
<td>556</td>
<td>564</td>
</tr>
<tr>
<td>Using Finding Tool Features</td>
<td>635</td>
<td>643</td>
</tr>
<tr>
<td>Retrieving Sources</td>
<td>572</td>
<td>573</td>
</tr>
<tr>
<td>Evaluating Sources</td>
<td>594</td>
<td>610</td>
</tr>
<tr>
<td>Documenting Sources</td>
<td>569</td>
<td>581</td>
</tr>
<tr>
<td>Understanding Economic, Legal, and Social Issues</td>
<td>559</td>
<td>571</td>
</tr>
</tbody>
</table>

The following conclusions do jump out at us from the SAILS study:

- Overall, UPX students’ information literacy skills are comparable to or significantly higher than those of students at other institutions.
- Overall, information literacy skills do not appear to significantly differ between online and on-ground students, and on average is higher for the online student.

The one limitation of both studies was that the participating students “opted in” therefore it is not strictly a random sample.

**Comparison**

Considering some of the typical online models and comparing these with the UOP Model throw up some interesting insights. At a high level the comparison has been summarized on the following page.
Table 5: A comparison between UOP online and a typical online University

<table>
<thead>
<tr>
<th>Elements of the model</th>
<th>Typical Online University</th>
<th>University of Phoenix</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nature of content</td>
<td>Rich media content / Live and recorded sessions</td>
<td>Text with deep topical explanation in specific areas and strong experiential elements</td>
</tr>
<tr>
<td>Time</td>
<td>May have synchronous elements</td>
<td>Entirely asynchronous</td>
</tr>
<tr>
<td>Space</td>
<td>Sometimes time and place requirements</td>
<td>No location requirement</td>
</tr>
<tr>
<td>Instructor : student ratio</td>
<td>1:40 and possibly higher</td>
<td>1:20 maximum</td>
</tr>
<tr>
<td>Instructor interaction with student</td>
<td>Limited, only topical</td>
<td>Very rich – ongoing practically on a daily basis</td>
</tr>
<tr>
<td>Peer interaction between students</td>
<td>Some – limited to team assignments etc</td>
<td>Very rich because of ongoing class participation requirements + Teamwork</td>
</tr>
<tr>
<td>Course duration</td>
<td>16 weeks</td>
<td>5-6 weeks</td>
</tr>
<tr>
<td>Faculty</td>
<td>Faculty from traditional academia</td>
<td>Practitioner faculty mostly from Industry</td>
</tr>
</tbody>
</table>
Conclusion
The above information provides strong evidence that collaboration as a central tenet of an online education program positively impacts the effectiveness of the learning. The recognition of the fact that humans mostly tend to work better in communities, and that such communities can be created online is fundamental to using the online medium effectively for learning.

While a comparative evaluation of the various online universities does not currently exist, it is safe to say that as the largest and most successful online University, with strong academic performance comparable to traditional Universities, the University of Phoenix does offer some evidence in favor of the use of collaboration and communities to improve the effectiveness of learning.
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Telephony Online, Desktop degrees, University of Phoenix takes education online, May 26, 1997

Why Recent Criticism of the University of Phoenix is Unjustified, Rhonda P. Urban


http://www.ets.org/portal/site/ets/menuitem.1488512ecfd5b8849a77b13bc3921509/?vgnextoid=ff3aaf5e44df4010VgnVCM10000022f95190RCRD&vgnextchannel=f98546f1674f4010VgnVCM10000022f95190RCRD

Link or MAPP Outline and Description, ETS website

https://www.projectsails.org/sails/aboutSAILS.php?page=aboutSAILS

Link to Project Sails website
Characteristics of Curriculum Design in Virtual Universities of Iran

Farhad Seraji  
Bu-Ali Sina University, Hamedan, Iran

Mohammad Attaran  
Majid Ali Asgari  
Tarbiat Moallen University, Tehran, Iran

Introduction

Rapid economic, social and technological changes have affected the life and career of individuals. To keep pace with these changes, each individual has to (re)learn continuously. Qualities of the contemporary era have caused an increasing demand for entering higher education courses (Groff and Mouza, 2008). In most countries, the number of those who want to enter the universities exceeds that of higher education institutions’ capacity. Therefore, to respond to the educational demands of these individuals, correspondence universities were established. However, lack of interaction and communication between the instructor and students and lack of access to reliable resources are the most important weaknesses of these universities with regard to learning quality (Buford and Harper, 2005). With development of communication technologies a new mode of distance learning has appeared called virtual university (ibid). In such an environment, the student and the instructor are on different grounds temporally and/or spatially and the learning material is provided for them through course management software, multimedia resources, internet and videoconference. To carry out individual and group learning activities, the student communicates with the instructor, classmates or other related people or resources using communicative facilities of computers (Attaran 1386/2007, Alestalo and Peltola, 2006). Besides providing a chance to improve learning quality in physical universities, these technologies have set the ground for founding and introduction of many private or enterprise universities to the realm of university education. For example, sixty-seven virtual universities and institutions started and ran educational courses during 2001-2005 in Australia (Siragusa, 2005). The same development has occurred in other countries such as the United States and European and Asian countries. In Iran, since 2001, physical universities such as the Shiraz University, Elm va San’at University, Khajeh Nasiroddin Tusi Industrial University, the University of Olum-e-Hadith etc. have gradually started virtual courses. With the development of information technology, there have been other virtual universities such as Mehr Alborz and Nur Tuba during the recent years entering the realm of higher education. Besides other infrastructural factors and their budget, growth and survival of these universities relies upon their curriculum quality. The quality of developing virtual curriculum has a major impact on virtual students’ learning and those in charge of virtual university curriculum development must put the principles of curriculum development into practice (Pollock and Comford, 2001). On the other hand, results of various researches (including Clark and
Mayer, 2004; Baptista and Pherson, 2004; Keengwe et al, 2008) show that pedagogic aspects are neglected in virtual university curriculum development. Improving the learning quality in virtual universities implies developing a structured curriculum in which the relation between elements of the curriculum and their integration with technological capabilities is demonstrated (Porter, 2004).

The constitutive elements of curriculum and the quality of their relationship is named curriculum design. Tayler counts these elements as four, Taba as eight, Klien as nine and Eisner as seven (Doll, 1989; Mehrmohammadi, 1383/2004). In this research, based on Klien the curriculum design consists of the identification of influential factors and 9 elements of: objectives, content, learning activities, learning material and resources, learners’ grouping, location, space, teaching strategies and assessment methods. The overall goal of this study is to examine features of curriculum design in Iranian virtual universities. In other words, the current research tries to answer the major question: “what is an Iranian virtual universities curriculum design characteristic?” Therefore, in this paper, first we seek to introduce curriculum design characteristics of Iranian virtual universities.

Methodology

The present research has a qualitative nature, using characteristic procedures of qualitative research such as purposeful selection of samples, triangle methods such as interview and researcher’s participation in the learning management system to collect data, and categorization and simplification for data analysis (Gall, Borg, Gall, 1997).

In this research, at first the samples (a list of universities providing virtual education) were selected by referring to the Bureau of Council of Higher Education Promotion. Then, based on criteria such as years of running virtual courses, level of participation in presenting e-learning, consistency of courses, on-line presentation of the whole course and its accessibility, three universities of Olum-e-Hadith Virtual College, Center of Electronic Education of Elm va San’at University and Center of open and e-learning of Khajeh Nasiroddin Tusi University were selected. Therefore, purposive sampling was applied in this research.

To gather data on curriculum design of the selected universities two methods were applied:

1. Examining and participating in learning management systems. For this, first researcher referred to the selected virtual universities. A two-week-valid student username and password was received. In this stage, principles and samples of some properties of curriculum design such as content, learning activities, learners’ grouping, learning material and resources, time, teaching strategies and information assessment methods were collected.

2. Interviewing with key informants. After setting an appointment with the most informed practitioners on curriculum design in each university, interviews were held and discussing influential factors, objectives, content, learning activities, learners’ grouping, learning material and resources, time, location, teaching strategies and information assessment methods, the required data were collected.

Data gathered through these complementary procedures were analyzed by categorization and simplification methods.

Findings

Main question of this research is: what is the features of curriculum design in Iranian virtual universities?
Iranian virtual universities

Olum-e-Hadith Virtual College

Olum-e-Hadith Virtual College was established in 1381/2002, aimed to promote research in hadith. Students should pass an entrance exam to enter the college. They pass one semester of 12 credit courses as the pre-studentship semester and can enter student course after passing the pre-studentship semester with a minimum average mark of 12. The college currently hosts 750 students and 2000 pre-students. The students graduate after passing 139 credit courses and will be provided with a B.A. certificate approved by Ministry of Science, Research and Technology (equivalent of Higher Education Ministry in other countries).

After entering the college and registering for the pre-studentship semester, the applicants will physically attend a training workshop to know the learning management system, in addition to virtual environment features, teaching methods, assessment methods, instructors and administrators of the college. The college also provides technical services and support for applicants after the start of semester. To facilitate access to resources, extend activities and hold final exams, the college has established learning centers in 26 cities inside Iran and Dubai, in U.A.E.

Facilities such as courses’ list, course sample, discussion and research rooms, virtual classes, Q&A, bulletin board, progress report and contact with support center are included in the learning management system of this college. The learning management system runs a short virtual course to make the students familiar with whole educational process. In curriculum development, the instructor as field expert, network and computer experts have the major role. Recently an educational technology expert has joined the group.

Khajeh Nasiroddin Tusi University Open and e-learning Center

The initial core of Center of open and e-learning of Khajeh Nasiroddin Tusi University was formed in 1383/2004 and in 1384/2005 with the approval of the Council of Higher Education Promotion; the center admitted students in B.S. of industrial engineering (system analysis and programming) and computer engineering. Currently, the center admits students in industrial engineering, computer engineering and information technology.

Admitting students was initially done through pre-studentship courses. But since 1385/2006 this is done through the national university entrance exam. At present the center hosts more than 700 students. It performs under the supervision of Khajeh Nasiroddin Tusi University and its graduates are issued with a
certificate of this university, electronic education noted in the certificate.
The learning management system of this center is designed by faculty members of Khajeh Nasiroddin Tusi University and includes these capabilities: educational content tree, academic calendar, interactive classes, course subjects and discussion forum, multiple-choice tests, question bank for instructors, explanatory tests, comments and knowledge bank. In the curriculum developed for this center, the instructor has the central role and experts in IT and multimedia development assist him/her. Table (1) shows curriculum design characteristics of these three virtual universities: Olum-e-Hadith Virtual College, Elm va San’at University e-learning center, Khajeh Nasiroddin Tusi University Open and e-learning Center.

<table>
<thead>
<tr>
<th>Curriculum elements</th>
<th>Characteristics of curriculum design in Olum-e-Hadith Virtual College</th>
<th>Characteristics of curriculum design in Elm va San’at University e-learning Center</th>
<th>Characteristics of curriculum design in Khajeh Nasiroddin Tusi University open and e-learning Center</th>
</tr>
</thead>
<tbody>
<tr>
<td>Influential factors</td>
<td>Curriculum design of this college is a result of designers experience in physical education and its integration with technology potentials.</td>
<td>Because of physical teaching experience and instructor-orientedness of the developers and technical and infrastructural limitations, the two influential factors on curriculum design haven’t been fully taken into consideration.</td>
<td>Communication, information and individualization potentials of IT and its capability to deliver content everywhere, every time are taken into consideration but not appropriately integrated with learner-oriented learning theories.</td>
</tr>
<tr>
<td>Goals &amp;Objectives</td>
<td>Curriculum objectives of this college come from the study of labor market needs, social functions of university education and academic subjects. These objectives are notified as ultimate objectives by Ministry of Science, Research and Technology and the instructor should derive specific goals from them.</td>
<td>Curriculum objectives of this center come from needs of the labor market and course subjects, notified as ultimate, general goals by the Ministry of Science, Research and Technology. Specific objectives are determined based on this by every instructor.</td>
<td>Curriculum objectives of this center come from needs of the labor market and course subjects, notified as ultimate, general goals by the Ministry of Science, Research and Technology. Specific objectives are determined based on this by every instructor.</td>
</tr>
<tr>
<td>Content</td>
<td>The selected content by this college are those presented in physical classes put in textual, audio, visual and animation formats. In preparing content, principles of multimedia content development have been applied as much as possible.</td>
<td>The selected content is the syllabi of physical curriculum. They are firstly used in textual format, later with audio and image. However, due to the absence of multimedia learning expert in the group of like the physical curricular content, the curricular content of these majors are notified by Ministry of Science, Research and Technology. Text, audio, video and animation are used for their presentation. Principles of multimedia content development haven’t been taken into consideration.</td>
<td></td>
</tr>
<tr>
<td>Learning activities</td>
<td>Participation in chat rooms, research, case study, blogging and practice are examples of curricular activities of this college.</td>
<td>Exercise, research, and discussion are some of the common practices of this center. Some instructors also use case study and web quest.</td>
<td>Exercise, collaboration, and discussion are some of the common practices of this center.</td>
</tr>
<tr>
<td>---------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Learning material and resources</td>
<td>Learning resources of this center are divided into two groups of physical and digital resources. All books, press and reading material in the library of the college are considered as physical resources and digital resources include software, databases, digital libraries and related newsgroups.</td>
<td>Students of this center have access to data banks of Elm va San’at University. Using the Al-Ghadir card, they can have access to learning resources of all universities and libraries. Therefore, the opportunity to use Persian and non-Persian learning resources.</td>
<td>Learning material and resources of this center are divided into two groups” - physical material and resources: books and printed material of Khajeh Nasiroddin Tusi University - Digital material and resources: knowledge banks, databases.</td>
</tr>
<tr>
<td>Learners’ grouping</td>
<td>The emphasis in curriculum design of this university is on individual study. However, students can form learning groups.</td>
<td>The curriculum design of the center emphasizes individual learning, since the number of students is high, students don’t have enough access to technology and they’re reluctant to work in groups.</td>
<td>The curriculum design of the center emphasizes individual learning, since the number of students is high and students don’t have enough access to technology.</td>
</tr>
<tr>
<td>Time</td>
<td>Virtual classes and mid-term and final term (physical) exams are held synchronously and access to curricular content, assignments and practices, self-assessment tests and instructor’s guiding in chat rooms is done asynchronously.</td>
<td>Virtual classes and mid-term and final exams (which is physical) are held synchronously and access to curricular content, assignments and practices, and instructor’s guiding in chat rooms is done asynchronously.</td>
<td>Virtual classes and mid-term and final exams (which is physical) are held synchronously and access to curricular content, assignments and practices, and instructor’s guiding in chat rooms is done asynchronously.</td>
</tr>
<tr>
<td>space</td>
<td>The curriculum has a national and international scope, at first for Persian-speaking students, and later for Arabic-speaking students, anglophones and francophones.</td>
<td>Curriculum of this center is designed for a national level, considering cultural and language characteristics of students.</td>
<td>Curriculum of this center is designed for a national level and applicants enter the center through national entrance exam. Curriculum is developed according to these conditions.</td>
</tr>
<tr>
<td>Teaching strategies</td>
<td>In curriculum design of this college, teaching signifies providing students with feed backs,</td>
<td>In curriculum design of this college, teaching consists of</td>
<td>In curriculum design of this college, teaching consists of</td>
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monitoring and guiding them. Instructors and their assistant bear the responsibility of teaching and guiding students.  

| Assessment methods | In curriculum design of this college, formative assessment is carried out by assessing student’s participation in forum, the quality of carrying out assignments and exercises, self-assessment and mid-term exams. Final assessment is done by holding physical final exams. The curriculum design of this college mainly emphasizes on the importance of final exam. | In curriculum design of this college, formative assessment is carried out by measures such as scoring assignments, students’ presence and activity in virtual classes and mid-term exams. Final assessment is done by holding physical final exams. The curriculum design of this college mainly emphasizes on the importance of final exam. | content, monitoring and assessment. Instructors and their assistant bear this responsibility. |

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In curriculum design of this college, formative assessment is carried out by measures such as scoring assignments, students’ presence and activity in virtual classes and mid-term exams. Final assessment is done by holding physical final exams. The curriculum design of this college mainly emphasizes on the importance of final exam.
Conclusion

Virtual learning environment has various potentials and facilities to improve the learning process. However, efficient use of these facilities and their integration with the curriculum needs a structured design that will use the capabilities for learning improvement. Curriculum development is a process in which decisions are made about influential factors, number of elements, and their relationship. If we want to examine these decisions, curriculum design can be probed as one representation. The present research identified characteristics of curriculum design of three Iranian virtual universities of Olum-e-Hadith Virtual College, Elm va San’at University e-learning center and Khajeh Nasiroddin Tusi University open and e-learning center were identified. The main results are as follows:

Identifying Influential Factors

To develop the curriculum, before determining the number of elements and the quality of their relations, first the influential factors must be identified. Understanding the capabilities of technology and considering learner-oriented are two factors influencing curriculum design of virtual universities. These factors have not been considered in curriculum design of Olum-e-Hadith Virtual College, Elm va San’at University's e-learning center and Khajeh Nasiroddin Tusi University's open and e-learning center.

Curriculum Objectives

To make decisions on objectives of virtual university’s curriculum, resources of determining objectives, levels of analysis and relevant approaches should be identified. In curriculum design of Olum-e-Hadith Virtual College, Elm va San’at University's e-learning center and Khajeh Nasiroddin Tusi University’s open and e-learning center these resources and levels of analysis have been determined, but their approach has been neglected.

Curriculum Content

In virtual university curriculum development decisions must be made on selection, organization and presentation form of the content. In curriculum design of Olum-e-Hadith Virtual College, Elm va San’at University's e-learning center and Khajeh Nasiroddin Tusi University's open and e-learning center, principles of selection and organization have been observed, but the three virtual universities have not taken due consideration of the principles regarding presentation form of electronic content.

Learning Activities

Virtual learning environment is an activity-based environment in which different activities must be designed to encourage students to learn. In curriculum design of Olum-e-Hadith Virtual College, Elm va San’at University's e-learning center and Khajeh Nasiroddin Tusi University's open and e-learning center limited activities have been incorporated. In other words, development of activities in curriculum design of these three universities is not in accord with the curriculum design directive model of virtual universities regarding principles and examples.

Learning Material and Resources

Another major characteristic of virtual learning environments is access to diverse learning material and resources. Curriculum developers must provide students with access to resources considering specific principles. In curriculum design of Olum-e-Hadith Virtual College, Elm va San’at University's e-learning center and Khajeh Nasiroddin Tusi University's open and e-learning center, the quality of access to resources is in accord with principles and examples of resource selection and provision.
Learners’ Grouping

There are various capabilities in a virtual learning environment that using them, a curriculum developer should encourage students towards group learning. In curriculum design of Olum-e-Hadith Virtual College, Elm va San’at University’s e-learning center and Khajeh Nasiroddin Tusi University’s open and e-learning center individual learning has been emphasized and no decision has been made to promote group learning.

Time

In curriculum design of virtual university different elements can be presented to students either synchronously or asynchronously. In curriculum design of Olum-e-Hadith Virtual College, Elm va San’at University’s e-learning center and Khajeh Nasiroddin Tusi University’s open and e-learning center time-related decisions have been made according to virtual learning environment.

Space

Considering the scope of virtual university’s curriculum (being national or international), interests, demands, and characteristics of students should be identified. In curriculum design of Olum-e-Hadith Virtual College, Elm va San’at University's e-learning center and Khajeh Nasiroddin Tusi University’s open and e-learning center decision are made based on interests, demands, and characteristics of students.

Teaching Strategies

In a virtual university, instead of presenting information, the instructor should guide students to construct knowledge and solve problems, provide them feedbacks, moderate discussions and encourage inquiry. In curriculum design of Olum-e-Hadith Virtual College, Elm va San’at University's e-learning center and Khajeh Nasiroddin Tusi University’s open and e-learning center, teaching strategies are implemented based on principles of selecting teaching strategies.

Assessment Methods

In a learner-oriented learning environment, assessment methods should be considered as a part of the learning process and their feedback should be used for learning improvement. In curriculum design of Olum-e-Hadith Virtual College, Elm va San’at University's e-learning center and Khajeh Nasiroddin Tusi University’s open and e-learning center principles and examples of assessment methods haven’t been selected based on the virtual environment curriculum design. Hence, to improve their curricula, developers and practitioners of the three studies virtual universities should:

1. Pay due consideration to influential factors of curriculum development in virtual environments.
2. Formulate and analyze curriculum objectives regarding approaches relevant for the environment.
3. Present the curriculum content to learners based on principles of presentation form of electronic content.
4. Provide diverse learning activities for the curriculum.
5. Encourage students to group learning and forming virtual groups.
6. Select assessment methods in accord with the virtual environment.
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Overcoming e-Transformation Challenges in the Middle East: A Case Study of the CAN/UAE East

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Abstract

E-learning technology is a pedagogical tool that is eroding the temporal and geographical barriers of conventional teaching methods. In this paper, we examine how a blended learning approach was used by a Canadian institution to deliver academic program to senior managers in a large corporation within the Middle East. This case not only illustrates the effectiveness of e-learning between Canada and the United Arab Emirates, but also illustrates its potential to overcome some of the e-transformation challenges that face organizations in the region today.

Introduction

Over the last decade, the growth of the Internet has transformed the way many educational institutions provide instruction. “The Internet can be used as a teaching machine, a source of information, a communication tool, an aid for teachers, a tool for students, and as a means of facilitating learning” (Shahin et al., 2007, P.28.1). The Internet enables institutions to deliver knowledge globally through e-learning systems. Welsh et al. (2003) describe e-learning as the use of an Internet-based technology to convey information and instruction. The huge potential of teaching over the Internet has influenced educational delivery and curriculum development, enabling academic institutions to not only teach locally but also reach globally.

In today’s business environment, professionals are becoming increasingly aware of the importance of education for cultivating a career that is continuously evolving. People who desire to be successful choose a learning strategy that allows them to develop their potential (Bentley et al., 2005). These individuals will arguably reach this level by not only working in a chosen profession, but also by belonging to an organization that offers professional development programs. E-learning has a significant role to play in the delivery of these programs, providing many options for the development of skilled human resources (Nisar, 2004). Providing these e-learning experiences represents a new horizon for organizations to develop and retain their employees. As Servage (2005) discusses, e-learning facilitates an overall higher personnel retention rate. Thus, investing in human capital has become an important strategic factor for the success of organizations around the globe (Roy and Raymond, 2008).

In this case study, the Canadian-United Arab Emirates (CAN/UAE) model introduces a combination of face-to-face (f2f) and e-learning methods intended to provide a more refined and blended learning environment. Blended learning, by definition, is the combination of the attributes of both
conventional and e-learning environments (Holton et al., 2006). This kind of learning has developed a relationship between instructor-led training and technologically based training (Holton et al., 2006). The f2f class interactions enable individuals to learn from their peers’ organizational experiences (Burton, 2005). Further, as Macdonald (2006) emphasizes, blended learning maintains the advantages of retaining f2f interactions among participants.

The CAN/UAE Model

With the rapid evolution of e-learning systems, it is often difficult to identify and implement the best learning platform. In this case, Desire2Learn’s (D2L) system has the components that satisfy the Centre for Business, Entrepreneurship, and Technology’s (CBET) requirements for supporting professional development within an organization in the UAE. Desire2Learn Inc. is located in Waterloo, Canada, and has developed a system which enables organizations to design, develop, and deliver educational programs utilizing a cutting-edge teaching model (Desire2Learn, 2008). D2L has global potential through interactive engagement, effective collaboration, empowered communication, and successful measurement of the overall progress of users (Desire2Learn, 2008).

CBET was founded in 2003, with the objective of becoming a global leader in entrepreneurship teaching and research. CBET is part of the University of Waterloo in Canada, which is considered to be one of the country’s most innovative universities (Armitage, 2008). CBET’s programs combine leading business theory and practices with entrepreneurial drive to develop individuals who can understand, mobilize, and direct technologies in rapidly changing business environments (Armitage, 2008).

CBET chose the D2L e-learning platform to deliver a structured academic graduate program in advanced management to an organization in the UAE. The objective of this program is to equip senior staff members with the specific knowledge and tools necessary to strengthen technical capabilities as well as overall management skills (Armitage, 2008). The program proposes to offer all courses with a blend of f2f and online, multi-media interaction. The model encompasses the following characteristics:

- CBET faculty members work with an organization to adapt the course curriculum
- The program is comprised of six courses completed over approximately six months
- Each course is taught in a compressed blended f2f and e-learning format over a two to three week period, which includes a professor visit to the location
- Courses include group work, assignments, case studies, simulations, quizzes, and participation activities

Roy and Raymond (2008) mention that due to competition in a global knowledge-based economy; organizations must attain increasingly higher levels of excellence and performance of their employees in order to maintain their competitive advantage. After successful completion of the program, participants receive a Graduate Diploma in Advanced Management from the University of Waterloo which will assist them achieve this competitive advantage.

Overcoming e-Transformation Challenges using CAN/UAE Model

The e-Transformation challenges faced by organizations in the Middle East are increasing due to the rapid development of Internet-based technologies. This case study examines how e-Transformation challenges may be addressed through the professional development process. The term ‘e-
Transformation’ in an organization means the shift from f2f business transactions to virtual business transactions using information technologies. This transformation consists of two dimensions, technological and organizational. It involves changing business architecture to reflect new roles, responsibilities and relationships within a transformed organization (Al-Mashari, 2001). The CAN/UAE model that overcomes some of the e-Transformation challenges is presented in Diagram-1 below:

**Diagram-1: CAN/UAE Model**

**Technological Familiarity**
One of the major problems with technology is its rapid pace of development and the requirement for people to constantly update their knowledge and skills. E-Transformation represents a change in paradigm, a different way of acting which establishes its own way of doing things. The demographics of the organization affect the absorptive capacity of employees when they are assimilating and
utilizing technology (Guild, 2008). Familiarity of using similar technologies assists in using new technologies (Rogers, 1995). However, the desire of individuals to adapt new technologies and the pace with which they are able to integrate these technologies are important to consider. The CAN/UAE model takes the above challenge into consideration by formulating training modules and familiarizing participants with the learning environment. In addition, an effort has been made to make material “usable” by taking audience expectations into consideration. Finally, the CAN/UAE model seeks to keep the channels of communication open between participants so that there is constant support on hand.

**Regional and Organizational Culture**

Bentley et al. (2005) indicate that culture is an essential part of learning, as it is often difficult for individuals to interpret different ways of thinking, perceiving, and behaving. E-learning technology is capable of fostering communication between students and instructors, allowing the use of different tools to accommodate different learning styles. Thus, e-learning fills the gap between the information presented and the learning outcome expectations of the student, resulting in a meaningful cross-cultural learning environment (Bélisle, 2007). Adopting e-learning systems within an organization permits employees to be exposed to an international understanding of different business concepts and methodologies which reinforces the structure of their own organization. By taking in consideration the regional and the organizational cultures, barriers can be greatly reduced by designing, developing, and delivering culturally sound educational program using a blended learning system (Holton et al., 2006). As Bélisle (2007) mentions that the online communications within the e-learning platform allows individuals to enhance their existing practices, learning involvements, and problem solving abilities. CAN/UAE model offers an experience in diversification of business across cultural boundaries. The culture of an organization shapes the way employees adapt to new technologies and processes. Understanding the values and culture of an organization is an important part of the CAN/UAE model.

**Temporal and Geographical Barriers**

The learning model used in this case illustrates how an e-learning technology can assist with overcoming temporal and geographical barriers between Canada and the UAE. Further, e-learning has the potential to significantly reduce the overall cost, such as travel and allocated time, of knowledge acquisition for firms (Mullins et al., 2007). As discussed by Pantaziz (2002), e-learning offers the organization a significant return on investment through reduced employee development time, superior productivity and enhanced overall business performance.

**Flexibility**

According to Hill (2006, P.188), “flexible learning environments combine characteristics associated with flexible delivery and flexible learning, enabling learners to have choices in terms of what, where, when, why, and how they learn”. The blended format, implemented in the CAN/UAE model, provides users with more flexibility with respect to the actual course outline, study practices, scheduling, examination forms, and variety of learning styles, as well as different methods of communication (Hill, 2006). E-learning technology allows students the opportunity to become more self-directed in acquiring knowledge and building understanding, an advantage for working professionals who need flexibility and the ability to learn at their own pace (Roy and Raymond, 2008). As Hill (2006) maintains, the flexibility provided by
the blended system requires individuals to initiate a real commitment and responsibility towards learning.

**Relevancy of Content**

As there is a transfer of knowledge through e-Transformation, the carriers of this knowledge must keep in mind the relevancy of the content being delivered. For example, an e-learning course being offered in UAE by Canadians needs to take into account what is relevant for the UAE economy at that particular period of time. This requires research, which can be obtained through feedback, about the needs and wants of prospective participants. Thus, the CAN/UAE model ensures that the content delivered to participants is constructed in light of the local environment, ensuring that the content can be applied according to the context.

Currently, many organizations provide their employees with professional development programs based on conventional learning systems, such as f2f instruction. However, an amalgamation of f2f and e-learning methods generates an improved learning environment. Innovative solutions that overcome some of the e-Transformation challenges can be found by implementing the CAN/UAE model. Furthermore, this blended model has application for a wide variety of industries throughout the Middle East.

**Pilot Survey Findings**

To illustrate how e-learning impacts e-Transformation, a survey instrument is being developed that will be used to examine the impact of the CAN/UAE model on the participants in the UAE. The findings of a pilot study are displayed below in Table-1.

<table>
<thead>
<tr>
<th>e-Transformation Challenges</th>
<th>Participants Reporting Positive Experience</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technological Familiarity</td>
<td>92%</td>
</tr>
<tr>
<td>Regional and Organizational Culture</td>
<td>84%</td>
</tr>
<tr>
<td>Temporal and Geographical Barriers</td>
<td>80%</td>
</tr>
<tr>
<td>Flexibility</td>
<td>93%</td>
</tr>
<tr>
<td>Relevancy of Content</td>
<td>89%</td>
</tr>
</tbody>
</table>

The data collected provides insights into the capability of the CAN/UAE model to address e-Transformation challenges in an organization. This pilot study examines how the effective use of the blended learning environment has been in establishing a positive learning experience for the participants where f2f and e-learning systems are implemented. However, two variables affected the results generated, demographics and number of participants where they are yet to be considered in the analysis at this stage due to the sample size of the pilot study. Due to these limitations, a larger sample will be conducted in the near future which will cover a larger portion of CAN/UAE students. The survey questions indicated that 94% of the participants found the overall experience to be “great.” A similar majority indicated that the scheduling of the course was convenient in light of their daily routines. In addition, close to 80% of participants found that the technology being used promoted communication and collaboration, while close to 90% of participants agreed that the construction of course material facilitated
efficiency in the way that they worked. In general, the findings illustrate that participants had satisfying experiences throughout the course.
Conclusion
Within a blended learning environment, designing, developing, and delivering educational programs, is a mechanism for introducing knowledge and developing the expertise within an organization. While a blended learning environment allows for a winning combination of face-to-face and online educational systems, it is crucial to ensure that the program fits the organization’s expectations and vision. Furthermore, specific outcomes should be measured to help assess the professional growth of the individuals participating in the program.

The CAN/UAE model demonstrates the effectiveness of an educational connection between a Canadian institution and an organization located in the UAE. The survey conducted with CAN/UAE participants indicates that the Desire2Learn platform is effective for program delivery. The case study highlighted how the CAN/UAE model can overcome the e-Transformation challenges faced by organizations in the Middle East. The model is flexible and can be adopted according to an organization’s unique requirements for knowledge transfer. This case study not only examines the effectiveness of the blended learning approach was used between Canada and the United Arab Emirates, but also argued that the same model can be more broadly scaled to encompass the whole of the Middle East.
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Arabic Cultural Values and e-Learning Design

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Introduction
As e-learning is used globally to support or replace classroom teaching, e-learning should be used in a way that enhances the quality of, and access to education. It also should be designed in a way that considers learners’ needs, including their cultural values in learning as these are assumed to affect the learning occurs. Therefore, as the Arab world increasingly uses e-learning in education and training, its culture must be considered in the way learning is designed. This paper reports on research done to identify how e-learning can be designed in a way that considers Arabic cultural values in learning. It presents design guidelines for Arabic cultural contexts that are based on principles proposed in a theoretical draft form, and refined through iterative research in a genuine learning environment in the Sultanate of Oman.

Background
e-learning can be used to address the issues of quality of and access to learning, for both campus-based and online courses. However, these benefits of e-learning are not automatic. There are several issues that need to be addressed to adequately support the use of e-learning. These include the following:

- Adequate and reliable administrative and technical infrastructure support systems
- Sufficient professional development and support for teachers in the design of pedagogically sound e-learning courses.
- Knowledge on how to design and implement courses that meet the needs of learners in their own particular learning context. The learners’ individual needs may include several issues, such how the learners’ cultural values and preferences affect the success of their learning.

The Arab world needs to address all these issues if it intends to use the e-learning environment to respond to its teaching and learning challenges. However, the final point is the focus of this paper.

Cultural preferences and values are commonly considered to affect the way that people learn, and the cultural differences between the learners and the learning design may result in poor learning performance. The technological interface is also proposed to affect the learning process; increasing the barriers to learning success that are caused by cultural differences (Ziguras, 1999, McLoughlin, 1999). However, little consideration to this is given in the way that learning is designed or in the way that teachers implement their courses. There is also little in the literature on how culture affects learning, and what can be done to make learning designs more effective and the learning experience more successful. As learning is increasingly provided in the technological environment of e-learning, then the effect of culture on learning needs to be investigated, and consequently how it may be designed in a way that considers cultural preferences. These issues are important as online learning has enabled access for learners in the Arab world and beyond, resulting in a greater cultural mix between learners and with the teachers. Thus the issue
of designing culturally appropriate learning requires investigation.
Culture concerns “the set of shared attitudes, values, goals, and practices” (Merriam-Webster Online Dictionary, 2008), “the meaning and values of social groups” (Henderson, 1996 p. 86). Gutierrez and Rogoff (2003 p. 20) describe culture as the “history and valued practices” of a community. Chen et al (1999 p. 219) comment that societies “do not possess culture, they are cultures”. These definitions of culture identify the significance of the cognitive and communicative perspectives of a society, highlighting culture as belonging to a community or society, not as characteristics of individuals. This is an important distinction, as individuals may have their own unique history or learning characteristics, and cultural values may be evident more within a group than in an individual.

The Problem of Culturally Appropriate Learning Design for the Arab World

If culture does impact learning, it should be designed in a way that considers Arabic cultural values. The learning design solution should be pedagogically sound and be a practical solution if it is to provide a useful guide for educators who are involved in the design of courses. Most practitioners do not have the time or expertise to analyse theoretical research for its use in the classroom. This means that for this research to have maximum impact in the Arab world, the design solutions should be immediately applicable to the local context. The solution should be practical principles that can guide in the way that learning is designed, for example, in which educational tools can be used and how learners prefer to use them. If the research has been carried out in the same or similar context that the educator works in, the usefulness of identified principles will be high, as these would have already accounted for this context in their design. This research seeks to respond to these challenges.

An Omani context was selected for the study and the research question posed is: how can online learning environments be designed for Omani contexts? The response to this question is first through a literature review, and secondly through empirical research to test and refine this solution to enable it to be contextualised and practically useful for educators.

Theoretical Approach

A review of the literature was conducted to identify previous models so that this study could build on the work of others in the field. A second literature review was conducted to propose draft design principles for culturally appropriate learning environments, using criteria developed from existing design models. A third examination of the literature was also performed, this time on research on Arabic cultural values and on how learners responded to the e-learning environment. These findings were used to propose practical design guidelines for learners of an Arabic cultural background in an Omani context.

Cultural Models

Several articles written between 1996 and 2000 called for cultural models for appropriate online learning design. Some models and guidelines were proposed as a response to this need, and these will be analysed to extract concepts for the development of a design solution for this investigation. Some responses, such as that of Joo (1999), Geer(2001) , and Ngeow and Kong (2002) suggest considering different decision-making styles, the use of grammar in conveying meaning differently or the need for flexibility in learning goals. However there were three models identified in the literature that provided useful concepts for this study.
Henderson (1996) developed a Multiple Cultural Model. This was based on a Model of Pedagogic Dimensions developed by Reeves (1992) that describes 14 different pedagogical aspects of technology design, with each having a value on a continuum, for example epistemology, with objectivism and constructivism extremes. Henderson (1996) proposes that this model can be applied to cultural appropriate courses, and she developed this model by adding further dimensions. Henderson (1996) explains that different cultural values would result in preferences for different positions on the continuum for each dimension.

Collis (1999) developed guidelines for designing flexibility in instructional design, based on Henderson’s (1996) model and previous research (Collis et al., 1997). It provides flexibility in a large number of dimensions, such as time, level, size and assessment standards. She also developed ten guidelines that recommend flexibility in the type, delivery and presentation of course resource materials, variety in the roles of teachers and students and, as well, in the manner and tools of interaction and group work.

McLoughlin and Oliver (2000) further developed the concepts proposed by Henderson (1996), Collis (1999) and others, with the proposal of culturally inclusive design principles. They emphasize the importance of a pedagogical approach that allows for cultural differences and the need for appropriate instructional design that would encourage participation of learners, regardless of cultural background.

Analysis of these three models identified four criteria that can be used to develop a model for culturally appropriate learning design for the Arab world.

1. A pedagogical basis: Good design principles should be pedagogically based in an established learning theory.

2. Learning Design: Design principles should include a learning design that is based in theory and can describe how cultural preferences can be applied to the learning environment.

3. Cultural preferences: The theory or model should be able to explain cultural preferences in learning for different communities or contexts and be able to inform the learning design.

4. Guidelines: There should be a practical means to direct the design of learning environments for individual contexts and be evaluated in each context of use.

The use of these criteria means that new design principles can be developed from the work of experts in the field.

**Analysis of the Literature to Develop Design Principles**

Criteria for culturally appropriate design principles describe the necessity of a pedagogical basis, for both the learning design strategy and the cultural aspects of learning. Thus the literature is examined for theories that fulfill these criteria for the extraction of sound design principles.

**A Pedagogical Basis for the Learning Design**

An analysis of cognitive, behaviourist and constructivist theories found that they could not fulfill the design criteria to support a learning design that would provide a culturally appropriate learning design. This is primarily because they do not consider the social significance of the learning environment, which is where cultural values are expressed. Behaviourist theories conceptualise learning as an observable trait and they do not account for the cognitive processes in learning (Mergel, 1998). Cognitive theories describe the development stages of cognitive skills and focus on the internal processes. Constructivist theories propose that the learner is active in the
learning process; but that learning is a private matter, and is the result of interaction with a problem, where the learners construct their own knowledge (Glaserfeld, 1992, Jonassen et al., 1995). Thus none of these theories considers the social environment of learning and therefore would not be able to link cultural values with learning theories and the learning design, as is required by the design criteria.

Vygotsky's sociocultural theory does focus on the learning environment and interestingly the sociocultural theories were also supported for cultural design models by Henderson (1996), and by McLoughlin and Oliver (2000). The social environment has a central role, and without which, the “development of the mind is impossible” (Cole and Wertsch, 2001 p. 4). This is because learning is considered not to be an individual matter, but that it is mediated. Vygotsky (1978) proposed that cognitive development is not a direct result of activity, but it is indirect; other people such as experts or caregivers must interact with the learner and use mediating tools to facilitate the learning process. Brown, Collins and Duguid (1989) explain that cognitive development occurs as learners begin to use new conceptual knowledge, like a set of new tools, which must be used before these can be fully understood. Thus, the centrality of the social environment and the role of others in the learning process mean that learning designed on this basis would be able to provide space for cultural values, as these are expressed in social relationships. This provides evidence for the support of Vygotsky's sociocultural theory as a pedagogical basis for culturally appropriate design principles.

A Cultural Theory to Inform the Learning Design

Vygotsky's theory is also suitable as a cultural theory. His sociocultural theory is sometimes called a histocultural theory because of the historical or time-based nature of the relationship between the learner and the mediators. As caregivers select the concepts and values that their culture values, the society preserves its values through the mediated process of learning from one generation to the next. Research has also shown that in different cultures, different tools are valued and taught and therefore the learners will express and prefer different values in each society. Studies of Nisbett (2003) and his colleagues supported those of Luria (1974), showing a relationship between the society’s values and its preferred cognitive strategies. Nisbett’s research used Vygotsky’s theory to explain how cultural values affect cognitive processing, and how historical constraints shaped the cultural values (Nisbett, 2003, Nisbett et al., 2001). His research found that there is a relationship between the values of a culture and its origins, and that geography is a key factor in how a society organises their social patterns and expectations. For example, if peaceful relationships between people are necessary for the community to function, as was in the rural Chinese society he studied, then it is likely that relationships will be more highly valued, and more rules applied to ensure correct and harmonious behaviour between individuals. Lloyd’s (1996) studies had similar findings. Thus the history of a culture can be used to determine its cultural preferences and values. Vygotsky's theory would therefore provide a means to explain cultural differences in learners, fulfilling the design criteria as a learning and a cultural theory, linking culture, pedagogy and learning design.

Guidelines for specific Learning Environments

The design criteria recommend the use of practical guidelines in the design of learning environments for specific contexts, for example for learning from an Arabic cultural background. The literature was analysed for learner responses to the online environment in an attempt to identify features that learners preferred for effective learning. In this review
of the literature, five concepts of interaction, social presence, collaboration, cognitive strategies and student-centred learning (Gunawardena and Zittle, 1996) were used as a framework for the extraction of the key concepts. These concepts can be used to apply the sociocultural theories to the online environment; therefore they can be used to constrain the findings within sociocultural boundaries.

In this literature review, research on online learners was used to identify key issues for learning success. For example, in some studies, learners were found to need to cross a threshold in the amount of online interaction before the course became a warm and welcoming place to study (Wegerif, 1998). Those who did not interact sufficiently did not cross the threshold and found the environment unfriendly. Picciano’s (2002) study compared social presence and interaction with performance. Although he found no relationship with the end of semester exams, there was a positive relationship with performance in tests that were based on more constructivist objectives, thus demonstrating a link between interaction, social presence and deeper learning skills. Over forty concepts were identified within the five sociocultural online themes. These themes were written as heuristics and proposed as draft guidelines, as is shown in the two examples in Table-1. These examples are within the student-centred learning online concept.

<table>
<thead>
<tr>
<th>No.</th>
<th>To develop student-centred learning:</th>
<th>Rationale</th>
<th>Supporting research and theory</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Provide training for learners on how to use student-centred courses</td>
<td>Students who have not had training use the tools minimally or only if they are required to, resulting in minimal interaction, less critical thinking skills are developed, and essential work often is not completed.</td>
<td>Sorensen &amp; Baylen, (2004); Wozniak &amp; Silveira, (2004)</td>
</tr>
<tr>
<td>2</td>
<td>Ensure that the tools are sufficient, suitable and are being used. If not, then modify the tools or provide training.</td>
<td>It has been found that if the tools are not being used correctly, or if students do not know how to use them, then other means will be used to complete the task, and the required skills do not develop.</td>
<td>Hernandez-Serrano &amp; Jonassen, (2003); Sharma &amp; Hannafin, (2002)</td>
</tr>
</tbody>
</table>

As is represented in Table-1, research in the literature can identify concepts for effective learning for those learners. These concepts, as shown in the middle column in Table -1, can be written in a way to inform the learning design, as shown in the left-hand column, exemplifying the practical and useable nature of the guidelines. Thus these guidelines provide a means for learner responses to inform the learning design within a sociocultural framework.

A search of the literature did not find any research on learners from an Arabic cultural background. However, the design principles propose the use of Vygotsky’s histocultural theory (Nisbett, 2003, Nisbett et al., 2001, Norenzayan et al., 2002) to identify cultural preferences in learning. This was done using research by Ong (1982), Zaharna (1995), Jousse (1990) and others, on the Arabic society’s historical and social organisation patterns. Cultural values and world views were identified and possible learning preferences were proposed as is summarised in Table-2.
Table-2: Summary of Proposed Preferred Learning Tools for Arabic Contexts

<table>
<thead>
<tr>
<th>Cultural Values</th>
<th>Proposed Strategies or Tools</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collectivist</td>
<td>Descriptive analyses may be preferred more than deductive analyses. Items are understood in their context, not in isolation. Commitment to others more than to own needs</td>
</tr>
<tr>
<td>Oral Language</td>
<td></td>
</tr>
<tr>
<td>Visual imagery</td>
<td>Language should be used to develop rich mental images. Other visual tools may be required</td>
</tr>
<tr>
<td>Story-based</td>
<td>Situated learning that is story-based or provides a vicarious experience may be preferred. Use of metaphors may be valued in descriptions</td>
</tr>
<tr>
<td>People-related</td>
<td>Apprenticeships providing scaffolding and other people-based support may be preferred.</td>
</tr>
</tbody>
</table>

The heurists previously developed from research on other learners, as exemplified in Table-1, provide a scaffold for how guidelines can be written. The values and cognitive tools that were proposed, as shown in Table-2 were rewritten as guidelines. Table-3 provides examples. These Arabic guidelines were added to the other guidelines for testing and refinement in the next stage of this research.

Table-3 Examples of Draft Guidelines for Arabic Learning Preferences

<table>
<thead>
<tr>
<th>No.</th>
<th>To develop student-centred learning:</th>
<th>Rationale</th>
<th>Supporting research and theory</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Use teacher-centred activities initially, and then move to more student-centred activities.</td>
<td>The society is hierarchal, and those who held the knowledge of the society and its customs were held in great respect. Therefore, learners may have difficulty in using activities where they learn from each other or from other sources instead of from the facilitator.</td>
<td>Foloran, (2002); Ong, (1982); Zaharna (1995)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>No.</th>
<th>To develop cognitive strategies:</th>
<th>Rationale</th>
<th>Supporting research and theory</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Provide ways to help learners develop mental images.</td>
<td>Visual imagery using multimedia or language helps develop mental images. Collectivist cultures tend to be more visually oriented as they are relationship oriented, and it is thought to be a cognitive tool to aid learning.</td>
<td>Egan, (2002); Nisbett et al., (2001)</td>
</tr>
</tbody>
</table>

Summary of analysis and synthesis of literature findings
Existing design models in the literature were used to develop criteria for culturally appropriate design principles for Arabic learning environments. This resulted in the selection of Vygotsky’s sociocultural theory as the pedagogical basis to of the design strategy and provides an explanation of how culture affects learning. The analysis of the literature also resulted in the proposal of how culturally contextualised guidelines may be proposed, as is represented in Figure- 1.
As is shown on Figure-1, research on learners can be used to identify learners’ preferences, as is shown in Point 1 in Figure-1. An analysis of the historical background of a culture, such as the Arabic culture, may also be used to propose learning preferences, as is shown in Point 4 in Figure-1. The learning preferences can be used to create guidelines for the learners’ context as shown in Point 2 in Figure-1. As these guidelines are practical and contextual, they may be applied to the design of the learning environment for the particular culture that they were designed for as is shown in Point 3 in Figure-1.

The draft guidelines developed at this stage are theoretical. Testing and refinement in a sustained and genuine learning environment should provide more robust and reliable results of the research, which is an aim of this research, and the focus of the next step in the research.

**Research Method**

The empirical stage of the research was used to test and refine the design guidelines that were proposed in the theoretical stage of the investigation.

**The Research Approach**
“solve real problems while at the same time constructing design principles that can inform future decisions” (p. 25).

These features are therefore compatible with the aim this investigation, to explore how learning environments can be designed that are cultural compatible for learners of an Arabic cultural background.

![Diagram](image)

As is shown in Figure-2, Design-based Research consists of four phases. Each can inform previous stages and therefore it has a cyclical nature, as iterative testing and evaluation results in modifications at all phases in the investigation (Reeves, 2006). This results in iterative refinement of both the learning environment and the design principles or guidelines. The end product will therefore be principles that have been developed from existing models, based on sound theory and refined in sustained genuine contexts of use. In this research, Phases One and Two of Design-based Research have been initially covered in the discussion of the learning and teaching problem and in the literature review. Phase Three is now described.

**The Research Study**

In this investigation, a case study strategy was selected for the data collection and analysis because its principles are compatible with Design-based Research. Case studies are used to investigate how or why participants respond in the way they do, and how can modifications be made to improve the design to make it more suitable for them. The main proponent of the case study strategy, Robert Yin(2003), also comments that this strategy is used when the study focuses on a “contemporary phenomenon within its real-life context” (p. 13) and using “prior development of theoretical propositions” (p.14) as is found in this research.

**The Context and the Participants**

The investigation was performed in an Omani educational institute, Sultan Qaboos University. Research participants selected for the study were faculty from an Arabic cultural background studying in a fully online professional development course that was run for university faculty members once every semester. There were two courses used in the research. These were designed to last 50 hours over an eight-week period at work or at home, but usually took three months to complete. The course facilitator was also the researcher and had run several similar courses over the previous years. Participants were provided with deadlines for the course units and assignments, as it was expected that they would work on the course together as a group. Flexibility was also provided in that they could work on the course components at any
time of the day or any part of the week that was suitable. After an initial workshop, but before the online course started, some course participants were sent an email to request if they would like to be a research participant in the online course.

Nine participants from the Arabian Gulf or Egypt were selected for the study; three participants in the first online course that was investigated, and six in the second. A participant information sheet and a participant consent form were provided and the research was approved by the university ethics committee.

**Research Tools**

As the procedure used was qualitative, several tools were selected to provide comprehensive rich data for analysis. This included:

1. Interviews for investigating participant responses to the learning environment. These were informal. If participants are expected to share personal information, there needs an atmosphere of trust. In this research, semi structured interviews were used.

2. Discourse in chats and forums was analysed using tools described by Henri (1991) and concerns the type of interactive responses of participants.

3. Analysis of chat and forums topics was analysed using a tool was developed by Poole (2000).

4. Social presence in chats and forums was analysed by a tool developed by Rourke, Anderson, Garrison and Archer (2001) who identified three categories of communicative responses that contribute to social presence. These were affective, interactive and cohesive responses.

5. Collaboration was analysed using the identification of conceptual and non conceptual phrases (Paulus, 2005), as this method showed itself to be a clear and easy tool to use.

6. Participant observation: Hoepfl (1997 p. 53) describes observation as the “classic form of data collection” in naturalistic research. Observation can be done by a researcher who is involved in the context with the participants, or when distant through the use of videos or other recording devices. They provide both a support and a check of the data gained from interviews.

7. Statistics from Moodle learning management system. The log files from the Moodle database provided data on student usage of the different pages and activities that they engaged in. This also showed the amount of time participants spent using different course components.

**Research Procedure**

During the implementation of the online courses, there were cycles of data collection, data analysis, modifications made to the proposed design guidelines, and changes made to the learning environment, as represented by Figures 1 and 2. As part of the Design-based Research principles, the analyses in each cycle were checked by a colleague, to ensure that there was sufficient empirical support for the theoretical modifications that were proposed. Figure 3 represents the procedures that were used in each cycle of research. There were three participants and three cycles in the first online course that was investigated, and six participants and two cycles in the second course. The figure lists only some of the tools used in this analysis.
Data was gathered, as represented in the left hand column of Figure-3. It was analysed for each case within the five sociocultural online themes, as shown in the next column. Conclusions were made for each research participant, for each of the five themes. These conclusions were then compared between each participant, as shown in the second to right column. These conclusions were then compared to the proposed design guidelines, to determine if the guidelines did or did not represent the learning environment that was preferred. Changes were proposed and made to both the guidelines and the learning environment, as represented in the right hand column in Figure-3. Following each cycle, changes were made to some guidelines, which were then further refined in later cycles. Some guidelines were supported and some were also added. Therefore over the entire research period, guidelines and the learning environment were being modified to increasingly reflect the learners' preferences.

**Issues of Quality in this Research**

This research met the criteria of quality for qualitative research in all four areas of credibility, transferability, dependability and confirmability (Mertens, 1998). A full description was provided of the context, of both the physical setting and the cultural setting and the comparisons of conclusions, meeting transferability criteria. The sustained research time of six months, and the large amounts of data used helped demonstrate authentic representations of the values of the research participants, and both helped meet
transferability criteria (LeCompte and Goetz, 1982). The documentation of all the steps for all cases, from the raw data to the conclusions, as well as the use of log files were kept for each research cycle helped demonstrate the dependability of the research (Hoepfl, 1997, LeCompte and Goetz, 1982, Mertens, 1998). Finally, for confirmability criteria, that is, neutrality in interpretation of results (Hoepfl, 1997), was met through a "chain of evidence" (Yin, 2003 p. 34), in the use of multiple sources of convergent evidence, and through the use peers to assess the findings.

Discussion of Results

This research resulted in a very large amount of data that had to be analysed, reduced and used to modify or support the draft guidelines that had been proposed in the theoretical stage of the research or in a previous iteration. The focus of the research was to refine the proposed guidelines, and to ensure that the research kept within its predetermined boundaries. The final outcome of this research was a set of guidelines that had been designed and refined for an Arabic learning environment.

Examples of the Iterative Guideline Process

As it is not practically possible to present all of the research findings, some examples of the research are provided. These use pseudonyms to protect the identity of the research participants.

In the first research cycle, interviews with participants found a lack of a sense of social community. Amal felt “alone and on my own”; Badar noted, “At the moment I feel I am working alone”; and Dawood said, “I feel alone so far”. Amal and Badar had made direct comments to others in the welcome or help forums and Amal had received responses from other people on the course, which she acknowledged. Dawood also recognised at least one other person on the course. However none of this was sufficient to make the participants feel they were part of the community. All cases commented on their desire to feel more of a community; for example, Dawood wanted to feel part of “the family of the course”. Data from the learning forums showed a lack of interaction by these research participants, and email communication from the facilitator did not help increase the amount of interaction. These findings suggest that there is not enough communication for these cases and affirms the importance of the social presence. The findings resulted in the proposal that more use should be made of the synchronous chat room and not just the asynchronous discussion forum. This modification could help to determine if this form of interaction would increase the sense of social presence. The draft guideline was 

"Use discussion forums, chat and email"

This was modified to include the sentence:

"More use should be made of the chat room from the first week”.

Through further iterations different modifications made. By the fourth cycle the guideline became

"Use both discussion forums and chat but chat is the preferred option”

This was supported in the last cycle of research.

A new guideline was added in the second research cycle. In the interviews, it was found that obligation and responsibility were important in interaction. Badar mentioned that he was able to spend a significant time on the course where he had “an obligation” to someone. For Dawood, responsibility related more to helping each other reach a common goal; “we have a specific objective that all of us are trying to reach.” The guideline proposed was:
"Design activities that require learners to be responsible to each other in completing the work."

The course design was modified to enable learners to be more responsible to each other but forum analysis and participant observation found that participants did not become more committed and their learning outcomes were compromised. The guidelines and course were further modified based on analysis of data from the forums, chats, assignments, interviews and Moodle Learning Management System database. These modifications essentially investigated, through design modification and analysis, how obligation and commitment could be initiated and how it related to learner participation in the course. By the final research cycle it was found that unless the participants already were committed to others, they did not complete the course, as is evident in comments by Majid:

"If you get them to know each other at the beginning and talk, personally, I think they will have more obligation to be online later in the course".

By contrast, one participant was committed to others from the beginning of the course. The data showed that she had the highest amount of interaction, showed the greatest amount of social presence, showed conceptual responses in collaborative tasks and achieved the learning outcomes. Therefore this confirmed by contrast with the conclusion for Majid. This guideline was modified to become:

"Help learners to first be committed and accountable to others, to help them become responsible in completing the work."

Other guidelines provided means to enable this to happen, for example in the recommendation to use an initial face-to-face environment to build relationships. After completion of the empirical phase of this research, 25 guidelines had been tested, modified and refined during the six months of research. During this testing phase, the online course that was being used by the learners was also iteratively modified to increasingly represent a learning environment that these learners preferred.

**Refined Guidelines**

The guidelines developed from this research are shown in Table-4. These guidelines were proposed and modified within five sociocultural online themes. There were 46 guidelines that were proposed in the draft, 23 were either modified or supported and two new ones were added.
### Table 4: Guidelines for an Omani Context

<table>
<thead>
<tr>
<th><strong>Social Presence</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1 Use both discussion forums and chat but chat is the preferred option.</td>
</tr>
<tr>
<td>1.2 Design groups, using participants’ social networks or from people within a close circle. For those new to</td>
</tr>
<tr>
<td>online learning, give sufficient time in the face-to-face environment.</td>
</tr>
<tr>
<td>1.3 Develop the sense of commitment and responsibility where the frequency of interaction is low.</td>
</tr>
<tr>
<td>1.4 Initiate social presence at the beginning of the course by developing relationships.</td>
</tr>
<tr>
<td>1.5 Use small groups to develop relationships, where affective language may be used.</td>
</tr>
<tr>
<td>1.6 Build a sense of teacher immediacy through the use of individual messages.</td>
</tr>
<tr>
<td>1.7 Enable participants to share affectively by developing relationships in the initial part of the course.</td>
</tr>
<tr>
<td>1.8 Help learners to first be committed and accountable to others, to help them become responsible in</td>
</tr>
<tr>
<td>completing the work.</td>
</tr>
<tr>
<td>1.9 Provide initial classes face-to-face for learners who are not sufficiently experienced interacting</td>
</tr>
<tr>
<td>in the online environment</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Interaction</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1 Design interaction as an integral part of course design but participant commitment or obligation to the</td>
</tr>
<tr>
<td>course and each other must be developed before interaction will occur.</td>
</tr>
<tr>
<td>2.2 Orientate students in how to use discussion boards and chat in the context of use. This includes</td>
</tr>
<tr>
<td>how to use discussion boards from a technical and educational perspective, as well as training as moderators.</td>
</tr>
<tr>
<td>2.3 Orientate learners on how to communicate in an interactive online classroom.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Collaboration</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>3.1 Base the discussion activity on learning issues if the goal of the collaboration is to develop</td>
</tr>
<tr>
<td>deeper learning at the conceptual level but commitment or obligation developed before this task can be</td>
</tr>
<tr>
<td>successful</td>
</tr>
<tr>
<td>3.2 Use separate roles or functions for some collaborative work, but commitment and responsibility must be</td>
</tr>
<tr>
<td>developed before cooperative tasks can be done successfully.</td>
</tr>
<tr>
<td>3.3 Design most tasks as group work, and give responsibilities to the group leader.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Cognitive Strategies</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>4.1 Use a variety of tools and support, including visual tools.</td>
</tr>
<tr>
<td>4.2 Use soft or spontaneous scaffolding through monitoring student learning.</td>
</tr>
<tr>
<td>4.3 Design cognitive tools or scaffolds in such a way that helps learners to understand how to</td>
</tr>
<tr>
<td>apply them.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Student-Centred Learning</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>5.1 Provide examples or activities that help learners to understand the type of learning that is expected of</td>
</tr>
<tr>
<td>them in student centred courses</td>
</tr>
<tr>
<td>5.2 Orientate learners to help them understand the benefits of a learner-centred environment.</td>
</tr>
<tr>
<td>5.3 Design activities that are integral to the course structure.</td>
</tr>
<tr>
<td>5.4 Ensure that the tools are sufficient, suitable and are being used. If not, then modify the tools or</td>
</tr>
<tr>
<td>provide training, and focus on the learning benefits.</td>
</tr>
<tr>
<td>5.5 Provide activities where learning is gained from peers or other sources, but also provide the support and</td>
</tr>
<tr>
<td>reminders of course deadlines.</td>
</tr>
<tr>
<td>5.6 Use a student-centred design.</td>
</tr>
<tr>
<td>5.7 Provide more support and scaffolding in the learning environment through, emailed assignment due dates or</td>
</tr>
<tr>
<td>calendar of deadlines and time management suggestions</td>
</tr>
</tbody>
</table>

**Guidelines represent Arabic cultural preferences in learning**

The guidelines were analysed for common themes. Eight themes emerged, and these are compared to the Arabic cultural world views.
previously identified in Table-2. The comparison is shown in Table-5. The left hand column in Table-5 presents the cultural world views and values that had been previously extracted from the literature, and as presented in Table-3. The right hand column shows the guidelines developed in this research, as presented in Table-4.

<table>
<thead>
<tr>
<th>Collectivist Values</th>
<th>Guideline themes identified</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collectivist Values</td>
<td>Descriptive analyses may be preferred more than deductive analyses.</td>
</tr>
<tr>
<td></td>
<td>1 Relationships need to be developed. Shown in guidelines: 1.2, 1.4, 1.5, 1.7</td>
</tr>
<tr>
<td></td>
<td>2 Commitment and responsibility need to be developed within the relationships. Shown in guidelines: 1.3, 1.8, 2.1, 3.1, 3.2</td>
</tr>
<tr>
<td></td>
<td>Items are understood in their context, not in isolation.</td>
</tr>
<tr>
<td></td>
<td>3 Working in a group is important 1.2, 1.5, 3.3</td>
</tr>
<tr>
<td></td>
<td>4 Support from others is needed to help learners 1.7, 5.5, 5.6, 5.7</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Oral Language</th>
<th>Guideline themes identified</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visual Imagery</td>
<td>Language should be used develop rich mental images and concepts.</td>
</tr>
<tr>
<td></td>
<td>5 The visual element is important 1.2, 1.9, 4.1</td>
</tr>
<tr>
<td>Story-based</td>
<td>Situated learning that is story-based or provides a vicarious experience may be preferred</td>
</tr>
<tr>
<td>Use of metaphors may be valued in descriptions</td>
<td>6 The context of use is preferred as is showing examples of use 2.2, 5.1, 5.7</td>
</tr>
<tr>
<td>Human-related</td>
<td>Apprenticeships providing scaffolding and other human-based support may be preferred.</td>
</tr>
<tr>
<td></td>
<td>7 Interaction that simulates the face-to-face experience is preferred. 1.2, 1.4, 1.9, 4.2, 4.3</td>
</tr>
<tr>
<td></td>
<td>8 Face-to-face is important for developing relationships. Guidelines: 1.1, 1.6, 4.2</td>
</tr>
</tbody>
</table>

It was found that there is strong alignment between the previously identified Arabic cultural values and the design guidelines developed in this research, as is represented in Table-5. Nearly all of the guidelines, from all five online themes, could be related to Arabic cultural values and worldviews. That is, the refinements made to the guidelines show that the participants preferred to learn in an environment that can be identified as supporting collectivist values, providing visual and human-related tools and in a situated context. These values had all been previously identified in the Arabic histocultural background (Arab Information Centre, 1999, Hitti, 1996, Ong, 1982, Zaharna, 1995) as summarised in Table-2. As the research data was collected from the learning environment, analysed and applied to the design guidelines, this demonstrates the ability of the design principles to be able to apply Arabic learners’ cultural values to the learning design.
This research found that the greatest number of refined guidelines was socially orientated ones, as is represented in Table-5, categories one to four. As was previously mentioned, it was found that social commitment, obligation and responsibility need to be developed before learners can be involved in the learning community and complete tasks effectively. The design guidelines developed from this research provide practical and useable scaffolding for course designers to build in concepts such as these into the learning environment. The research also found that the guidelines were modified to state that face-to-face orientation is important in helping to develop the social learning community in a culturally-preferred manner. Other guidelines, as represented in Table-4 also promote other culturally preferred ways of learning to help enable successful learning for those from an Arabic cultural background. It is also important to note that many of the refinements were made to guidelines that had been developed from general literature concerning online learning, and it was not realized that these guidelines carried cultural values. For example it is generally presumed that learners must interact online sufficiently to develop relationships (Wegerif, 1998). However in the Arabic context, it was found that relationships and responsibility to others must be built before interaction would occur. This indicates that many concepts that are assumed to be necessary for effective online learning may instead be culturally-related concepts; indicating the significance of culture and the necessity for research in cultural contexts.

**Guidelines Support their Pedagogical Basis**

From the initial theoretical stages of this research, the sociocultural theory has been supported as the pedagogical basis for these design principles as it met the criteria that were built on existing cultural design models in the literature. During the iterative phase, this theory was supported in two further ways. First, it was found that it was possible to use the five sociocultural online themes as a framework for data analysis and guideline modification. Secondly it was found that guideline modifications could be made within all the five online themes, demonstrating the ability of these themes to constrain the findings within this sociocultural framework. Thus, the sociocultural theories should be used as the basis of the learning design strategy and the design guidelines should be used to incorporate cultural preferences into the learning design.

The sociocultural learning design strategy focuses on the activities that are performed by a professional community in their authentic environment, therefore social support, scaffolding and resources designed into the learning environment to help learners achieve the required learning outcomes (Grabinger et al., 2007, Hall, 2007). In this research, the learning environment was designed according to these principles. The guidelines were reorganised from the five online themes into categories such as for orientating learners, guidelines for course preparation and implementation, and guidelines for developing teacher immediacy skills and spontaneous scaffolding for example in project feedback. These categories were then used to apply the learners’ cultural preferences, through the design guidelines, to the learning environment. As the guidelines and the learning design strategy were based in Vygotsky's sociocultural theory, the practical application of the design guidelines continued to be pedagogically based.

**Continuing Research is Recommended**

The guidelines developed in this research are representative of Arabic cultural learning preferences. However, continuing research would make this increasingly so, as throughout the five cycles of research, modifications were made in each cycle. It
should also be noted that these guidelines were developed within a particular learning community. The greater the difference between this community and other Arabic communities, the greater is the need for continuing iterative research, to contextualise the guidelines for alignment to the cultural preferences of each learning community.

Therefore this would suggest that the design guidelines in this research should be visualised as the initial guidelines for a learning design, but should always be accompanied by continuing research or reflective practice. Further research is necessary to build on these findings.
Conclusion

This research has developed guidelines for the design of e-learning environments for learners of an Arabic cultural background. The guidelines are pedagogically based within Vygotsky’s sociocultural theory, link culture, theory, and learning design, and were developed from existing cultural design models. These guidelines have been tested and refined in an authentic Arabic learning environment, and it was found they are based on the preferences of these learners and reflect the cultural values of the learners’ Arabic cultural background, this demonstrates the ability of the guidelines to account for learners’ cultural preferences and therefore be used in the design of learning for Arabic cultural contexts.

The guidelines are presented within five online learning themes, however they may be reorganised into other categories, for example for the design, orientation and implementation of courses, as was done in this research and within a sociocultural design strategy. This shows that these guidelines are practical and immediately useful for practitioners and instruction designers, enabling this research to provide a practical solution for a teaching and learning challenge in the Arab world.

As was also found, the guidelines continued to be modified in each cycle of research. This means that the use of the guidelines from this research should be accompanied by tools for continuing research so that the guidelines may continue increasingly represent the preferences of the learners. This is significant where the contexts are different from those in this research.

It was also found that most modifications made to the guidelines were identified as cultural, and that cultural preferences may be found in more aspects of online learning than previously presumed. This means that the impact of culture on learning is significant, and designs that consider culture are necessary. Therefore, as the Arab world increasingly uses e-learning in education and training, culturally appropriate learning environments are necessary for learners to have a successful experience.
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Assessment Techniques of e-Learning Courses in VET: The European Leonardo Da Vinci Programme Showcase

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Abstract

This case study is focused on the assessment of projects financed in the framework of a European programme - Leonardo da Vinci, 2000 – 2006. Mainly, one aimed to determine how many projects, having Romanian promoters, financed within this European programme, developed online courses, and to evaluate the contents of those courses. An evaluation instrument is proposed / described that synthesizes course development criteria.

Introduction

The e-Learning initiative, adopted by the European Union identified four priority lines of action (European Commission 2001):

- Improvement of infrastructures and equipment (Internet access in all classrooms, ratio of 5-15 pupils per multimedia computer),
- A training drive at all levels (digital literacy for all school leavers, promoting the use by teachers of digital technologies in education, creation of online learning platforms, adaptation of school curricula, etc),
- Development of quality content and training services on the basis of different reference models,
- Networking of schools in Europe.

Some situation overviews (Riddy & Fill 2003) have noticed a retard of objectives attainment in European Member States, but eLearning projects have shown positive return on investment. So, many organisations are currently reluctant to make the strategic decisions required to embrace eLearning for staff training. Largely, the eLearning European market and its offerings have matured not only concerning quality content, management and delivery, but also in terms of eLearning vendors to position offerings into the market. Some statistics per European countries as development, topics, and tendencies were detailed (Kolding 2003). The assessment of quality (Riddy & Fill 2003) of eLearning resources and eLearning offerings, in general, is an as important issue as the eLearning courseware and the interest for establishing an on-line evaluation methodology links the tutors, the managers, the learners, all the above-mentioned specialists.

The Leonardo da Vinci European Programme has contributed to the implementation of a vocational training policy for the Community, which supports the actions of Member States. The European Council has adopted a second phase of the programme for the period 2000 – 2006 by Decision 1999/382/EC with the aim is to promote new practical approaches in vocational training policies in the Member Countries. One of the specific measures linked to the Leonardo da Vinci Program, entitled Procedure B – Pilot projects, Language competences & Transnational networks are intended to stimulate the process.
of innovation and to enhance the quality of training and vocational guidance. The projects financed under this measure develop innovative tangible products, using new information and communication technologies, where appropriate. Certainly these products should allow the implementation of the European vocational training policy, but should be adopted and valorised in the labour market by different target groups.

Our study is based on the Romanian pilot projects targeting eLearning or developing, among other tangible training outcomes, eLearning, too. These projects are characterised through an important transnational cooperation and expertise component, so even if the considered case studies projects were strongly supported by Romanian organisations, the European state of art and tendencies in eLearning might be noticed.

The General Directorate for Education & Culture, responsible, among other European financing initiatives, for the Leonardo da Vinci Programme, has established a set of results/outputs assessment indicators. Among these indicators descriptors, one might select / adapt those appropriate indicators for eLearning resources as pilot projects results / outcomes, as follows: communication & media used (quality of interaction between material and target group / course participant, choice of media with respect to content, etc); evaluation (assessment criteria and procedures, ongoing and final assessment tests, quality of feedback with respect to answers to self-assessment questions, etc); technology: audio-video support (material organisation and aesthetics) and electronic support (material organisation, aesthetics, ergonomics and use of media, produced information etc.)

A Case Study Regarding Romanian Projects (Procedure B) Containing eLearning Resources

The purpose of this study is to contribute to a better understanding of how eLearning materials, developed within an European Programme by transnational consortia leaded by Romanian institution can reach the quality indicators fixed by the European Commission. The case study had two broad objectives: to document the process of evaluation of eLearning materials and to illustrate the outcome of applying this practice. In accordance with the quality criteria and regulations established in frame of the Leonardo da Vinci Programme, a number of pilot projects with Romanian promoters were financed. These projects have proposed different innovative eLearning programmes (reported as projects outcomes / results) developed in European transnational partnerships (see Table 1).

<table>
<thead>
<tr>
<th>Year</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>T</td>
<td>w/L</td>
<td>T</td>
<td>w/L</td>
<td>T</td>
<td>w/L</td>
<td>T</td>
</tr>
<tr>
<td>~8</td>
<td>4</td>
<td>6</td>
<td>~6</td>
<td>3</td>
<td>~6</td>
<td>3</td>
<td>~6</td>
</tr>
<tr>
<td>Total budget (Eur)</td>
<td>~1900000</td>
<td>~1700000</td>
<td>~1700000</td>
<td>~1400000</td>
<td>~700000</td>
<td>~1200000</td>
<td>~600000</td>
</tr>
</tbody>
</table>

Legend: T – total (total number of projects); w/L – among the total number of projects, several projects developed training products / outcomes having eLearning elements.
A similar analysis, but looking for the participation of Romanian organizations in transnational partnerships coordinated by other European organizations, one might notice an increase of interest in all thematic areas, but, in the same time, in e-learning component (Table 2).

Table 2. Projects with Romanian partners (Procedure B, 2000 – 2005)

<table>
<thead>
<tr>
<th>Year</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
</tr>
</thead>
<tbody>
<tr>
<td>Numb</td>
<td>T</td>
<td>w/L</td>
<td>T</td>
<td>w/L</td>
<td>T</td>
<td>w/L</td>
<td>T</td>
</tr>
<tr>
<td>31</td>
<td>10</td>
<td>37</td>
<td>12</td>
<td>40</td>
<td>18</td>
<td>43</td>
<td>22</td>
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<tr>
<td>43</td>
<td>19</td>
<td>52</td>
<td>25</td>
<td>36</td>
<td>17</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Legend: T – total (total number of projects); w/L – among the total number of projects, several projects developed training products / outcomes having eLearning elements.

Moreover, the topics covered by the pilot projects coordinated by Romanian promoters include training modules / products in different fields – as presented in Fig. 1.

![Fig1: Thematic covered by pilot projects coordinated by Romanian promoters (2000 – 2006) Legend: The numbers inside the columns represent the number of projects focused on the mentioned topic iar e problema cu colurile si zice ca se tipareste cu se vede pe foaie](image)

Finally, having in mind that each project should be addressed to certain beneficiaries and the training products should be dedicated, tested and validated accordingly, we might claim that the (global) analysis of the target groups involved in vocational training (VT) via eLearning, as suggested by the analysis of projects under Exercises 2000 - 2006, leads to a pyramid shaped structure (some values have a cumulative effect):
From the viewpoint of eLearning results, analyzed pilot projects (financing exercises 2000 – 2006, one exercise per year) mainly focus on the priorities set in EC Calls. The analysis of the content has unraveled the following conclusions. The figures are depicted based on the final rating of evaluated pilot projects and their tangible results. A comparison of the final results of the projects with the project drafts, addressing a certain priority and specific target groups submitted in order to be financed, has been performed using the assessment form and the indicators established by the European Commission.

Employability

The project results (in the eLearning field) are likely to ensure the individual capacity of getting integrated into the labor market considering the rich and wide range of VT offerings, starting from the most specialized ones, such as GIS (Training Program for Local Public Administrations in Using Geographical Information and Spatial Databases – RO/00/B/F/PP141076) and ending with some very general ones: Virtual – Electro – Lab, RO/01/B/F/PP141024, Building a Web-Based Trainers’ Wide Open Resource for Learning and Development, RO/02/B/F/PP141053, Formation Virtuelle des Jeunes Createurs d’entreprises Innovantes, RO/05/B/F/PP-175012.
Many of these projects meant to and did train the trainers who later became - in the project framework - facilitators of VT and, in the same time, the first end-users of the project curriculum and manuals.

**Partnership**

Most project engendered partnerships valorized their field of expertise, both professionally/scientifically and institutionally. One should also mention the beneficial cooperation between institutions specializing in VT and SMEs or SME incubators, such as: Development of a Front-Line Advice – Guidance – Counseling (RO/03/B/F/PP175013), Multimedia Training Network for an Effective Development of the ICT Basis in SMEs, on an European View (RO/01/B/F/PP 141119), Develop Quality Training Approaches for Property Market Valuation Professionals for an Effective Property Tax Administration, (RO/05/B/F/PP-175018), Valorization of an Experiment-based Training System through a Transnational Educational Network Development, (RO/06/B/F/NT-175014).
Fig5: Quality assessment regarding Leonardo leading projects with Romanian promoters (priority: partnership).

Social Inclusion
Projects financed under the 2000-2006 exercises targeted most particularly the social inclusion at disadvantaged people on the labour market. Remarkable results have been obtained with respect to encouraging access to VT via projects such as: The Vocational Training by ODL of Young People With a Locomotors Disadvantage (RO/00/B/F/PP 141043), New Forms of Learning & Basic Skills for Advanced, including Lifelong, eVET, in Internet generated Occupations (RO/03/B/F/PP/175006), Establishing an European Centre for the integration of Institutionalized Children (RO/01/B/F/PP141058), Initiation and Sustainable Vocational Training for Disabled People - ECOTRAINING (RO/03/B/F/PP-175022) which are mapped on providing highly specialized and flexible training via open distance learning techniques.

Fig6: Quality assessment regarding Leonardo leading projects with Romanian promoters (priority: social inclusion)
Adaptability and Entrepreneurship

Adaptability and entrepreneurship have been promoted by projects that ensure the VT support for the development of SMEs. There were designed and produced - as products of pilot projects - VT materials targeted at developing entrepreneurial skills in key areas for SME operation: Specialized IT, Business Management, Business Administration, Industrial property, E-commerce (see Figure 7), such as: L’assurance de la Qualité Totale dans les entreprises européennes d’ameublement par la formation des ouvriers à l’Auto Qualité, (RO/01/B/F/PP141047), Electronic Business within Transnational Networks of Small and Medium-Sized Enterprises as a Contribution to Job-Oriented further Education, Technical Progress and Employment (RO/02/B/F/PP141049), Formation Virtuelle des Jeunes Createurs d’entreprises Innovantes, (RO/05/B/F/PP-175012), SMEs Action learning facilitator (RO/06/B/F/PP-175026)

One may rate as remarkable the offer of VT products and the best and very personal use made in each project of the ITC support to its products. In most project products, ITC tools (and especially eLearning techniques) are used discriminatively, from trainers to trainees.

Fig 7: Quality assessment regarding Leonardo leading projects with Romanian promoters (priority: adaptability and entrepreneurship)
Conclusion

After this analysis, the following weaknesses were found regarding the promoters’ organizations involved in the planning and implementation of teaching/learning component of eLearning:

1. It is a lack of a strategic plan for eLearning development: most educational structures in our study have documents to show the ICT planning (after the project running), which are mainly related to acquisition of new ICT infrastructure. Some of other plans were still in the mind of people responsible for managing the eLearning.

2. eLearning is sporadic: in the organizations involved in Leonardo da Vinci Program, the decision to use eLearning is a top-down process, related to the top management, mainly because everyone else is doing it and it appears fashion at European level.

3. It is insufficient funding to carry out a good project: while a lot of promoters have to work with a limited budget allocated for the development of teaching and learning materials, the quality of hardware architecture and course development is low.

4. Lack of skills and experience among organizations to use eLearning: in most institutions involved in education & training, the instruction is usually provided “in house” for the lecturers to develop the content and to use the new eLearning facilities.

Finally, as we can see it now, the future of eLearning in Europe (via Romania, as in all other countries), will be more and more based on eLearning technology: the accessibility to computers and Internet is rapidly improving, and the most important obstacle will be (with high probability) the limited capacity to produce high-quality eLearning materials.
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JUSUR: The Saudi Learning Management System

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Abstract

Most educational institutes worldwide are adopting different forms of E-Learning tools to enhance their traditional learning system. Among these e-Learning tools is the use of Learning Management Systems (LMS), to distribute on-line learning materials and assessments, to enhance communication, collaboration, and community building, as well as for the creation and management of online learning courses. Yet, there are dozens of LMS packages with diverse features that an institute can choose from.

This paper presents JUSUR, a new Learning Management System (LMS) designed and operated by the National Center of E-Learning and Distance Learning in the kingdom of Saudi Arabia. The rationale of creating JUSUR is discussed and its system architecture is presented. Also the uptake of JUSUR in Saudi Arabian HE institutes is shown along with the future directions of the new LMS.

Introduction

When computers were first introduced in the educational world, they were simply used as a media for delivering information with little or no type of direct interaction with the instructor/trainer, and learning materials were delivered to the student using compact or/and floppy disks. Then as the Internet began to become the dominant media for delivering education online via a set of services such as email, discussion boards and chat rooms, the concept of E-Learning (Electronic Learning) started to emerge. Therefore, the integration of email, chat and discussion board services into monolithic modules to be able to manage pedagogical aspects of online learning have created what is called a Learning Management System (LMS) or Virtual Learning Environment (VLE). This technological step made the learning process more organized and robust.

Nowadays, a vast number of Learning Management Systems (LMSs), whether commercial (e.g. BlackboardTM) or open source (e.g. Moodle), offer a set of services for the distribution of on-line learning materials, assessment, communication, collaboration, and community building, as well as for the creation and management of online learning courses. Most of these systems provide the basic software platform for supporting web-based learning in a practical and pedagogically sound manner. However, different academic institutions worldwide prefer the use of their own self-made LMS; this is the case with JUSUR, an LMS designed and operated by the National Center of E-Learning and Distance Learning in order to manage the E-Learning process in the kingdom of Saudi Arabia.

This paper will present JUSUR LMS and its major functionality in the following order: section 2, gives a brief background on LMSs and VLEs and their classifications. Section 3 defines JUSUR and describes its features. Section 4 presents JUSUR system architecture and its main components. Section 5, discusses the adoption and uptake of JUSUR in Saudi Arabia Higher Education (HE) institutes. Section 6 compares JUSUR against other
open source LMSs. Finally, section 7 concludes the paper with future directions of JUSUR.

Background

Virtual Learning Environments (VLEs) also known as Learning Management Systems (LMSs) were first introduced in the mid 90’s as a simple asynchronous system with minimum capabilities. It is not until the late 90’s when the commercial VLEs with advanced and improved features become widely acceptable. Thus to know what a VLE encompass Kumar (1998) gave the following definition of a VLE

“...is an integrated university environment where students can apply for admission over the internet, enroll in the classes offered by VLE after admission, access a complete course, take tests, and interact with the professors as well as classmates”.

In some context VLEs can be also called a Learning Management System (LMS), Course Management System (CMS), or Learning Support System (LSS) (Wikipedia, 2008). VLE features include: communication and productivity tools, student involvement tools, course delivery, to name just a few and to read a detailed description about VLE features and objectives please refer to (Kumar, 1998 and Wikipedia, 2008).

It’s worth knowing that a VLE plus the surrounding systems (which include student records, learning resource management systems, timetabling and financial systems) do constitute a Managed Learning Environment (MLE) (Figure 1).

![Managed Learning Environment](image)

**Fig 1:** The JISC's model of an MLE (including a VLE)
**Classification of VLE Systems**

VLE systems can be classified from different points of view (i.e. functional and economical). One classification is based on the functional characteristics of a VLE. As Totkov (2003) pointed that VLEs have evolved into three generations. The first generation VLEs include web interfaces (for students and for instructor) and integration of facilities such as discussion forum, assignments delivery system and e-mail. The course is organized as self-teaching with animation, interaction and team collaboration. The second generation VLEs consists of a content management system based on a database of learning objects from the one side and an e-learning platform in which the learning process is structured and the activities and the learning objects are linked together.

While the third generation VLEs has an advance set of features such as interchange ability of learning materials, dynamic personalized learning path and blended learning with integration of a live session (Totkov, 2003).

Another classification of VLEs can be based on an economic approach. Thus a VLE can be classified into three categories: self-developed systems, commercial systems and open source systems.

Firstly, the self-developed learning management system is the best solution to fit a specific university needs (as JUSUR has done, see section 3), note that this kind of VLE has its cons and pros. From the pros side, the VLE will be tailored to the university specifications and requirements and the system can be easily extended to adapt to the new changes in the university, so it can save the university some money in the long run. Self-developed systems also avoid linguistic problems since it will be supportive of local needs and target groups. While the cons of a self-developed system, encompasses the need for plenty of time, man-power and money to achieve the required system.

In an interesting study by Paulsen (2003) about 113 European institutes and higher education experience with LMS, he has shown that several Nordic institutions prefer self-developed systems. He also said that the Nordic institutions “perceive the commercial systems as expensive and complex and want to develop the systems to support their local needs. They wanted cost-effective systems with the ability to handle continuous enrollment and integration with student administrative systems and economy systems” (Paulsen, 2003).

Some examples of self-developed LMS include ELIAS from University of Vigo in Spain, e-cursos from Associação Empresarial de Portugal institute in Portuguese and VC Prolog Tutor from Osnabrueck institute in Germany.

Secondly, are the commercial VLE systems which require an institute to have a license to use the software. Although these systems come with almost everything in mind, they still entail some hidden costs such as system upgrades and maintenance. Moreover, these commercial systems do not fulfill some universities and higher education institutes needs in terms of tailored features and costs (hardware and software). To give an example of two popular VLE systems, most institutes world-wide use either Blackboard or WebCT.

Finally, are the open source and the next generation systems such as Moodle and Sakai. These open source systems encompass most of the commercial VLE systems characteristics but from another angle. To explain that, we know that most VLEs are instructor-oriented and heavily concerned with how course content is delivered while Moodle, the open source VLE, is designed to support pedagogies based on social constructionist theory in which students are involved in constructing their own knowledge (i.e. learner-oriented). Moodle also includes
activity modules such as forums, chats, resources, quizzes, surveys, choices, workshops, glossaries, lessons, and assignments. Moreover, it has been translated into over 60 languages and supports the popular SCORM standard for content packaging.

On the other hand, the Sakai Project is a community source software development project founded by the University of Michigan, Indiana University, MIT, Stanford, the uPortal Consortium, and the Open Knowledge Initiative (OKI) with the support of the Andrew W. Mellon Foundation. The project is producing open source Collaboration and Learning Environment (CLE) software with the first release in July 2004.

Even though the open source e-learning software paradigm looks promising to many people, Dalziel (2003) points out some of the downsides of open source e-learning software. One of the main downsides is the lack of interoperability between open source e-learning developments. For example, the IMS digital repositories interoperability (DRI) specification and the OKI digital repository API service are not compatible based on questions that were asked in February 2003 Vancouver IMS meeting. Besides, there are the problem of loss of specialties expertise, loss of continuity and risk of duplication (Dalziel, 2003).

There are also international projects like the e-Learning Framework (ELF) that is funded by JISC. The project effort is to develop a service-orientated approach (SOA) for the development and integration of computer systems in the sphere of learning, research and education administration. The framework consists of a wide range of software components which implements services within the e-learning framework.

**JUSUR: Definition, Rational and Features**

From the previous discussion it seems that the market has various flavors of LMSs/VLEs, each of which has its own standards and specifications. These differences raised the issue for the need of a self-developed learning management system designed and operated by the National Center of E-learning and Distance Learning in order to manage the E-Learning process in the kingdom of Saudi Arabia. Besides, one of the National Center strategic plans is to have an LMS that does not require any licensing and its intellectual property is owned by the ministry of HE in Saudi Arabia.

In order to achieve these goals, a team from the National Center of E-learning and distance learning conducted a comprehensive survey on existing LMSs (commercial and open source). This survey lasts around nine months and studied the different LMS solutions used worldwide. A metric was then produced, containing the requirements and specifications required by any successful LMS.

Then, a Malaysian company, called the Multimedia Technology Enhancement Operations (METEOR), was hired with staff from Saudi Arabia to implement the system using the compiled metric of specifications and requirements.

Technically speaking, JUSUR (Figure 1) was built around METEOR-OUÚ’s popular course management system to provide entire online campuses centered on the core activity of teaching and learning in the HE system in Saudi Arabia.
The name JUSUR actually originated from the Arabic word ("جسور") which means “Bridges”. Thus, JUSUR intention is to bridge the gap between traditional learning and online learning by providing the following key features:

- Registration: registering students in the portal.
- Schedule: Planning the course and the way of teaching it.
- Delivery: Making the course available for users.
- Tracking: Following up the students’ progress as well as issuing reports of students’ performance.
- Communication: students contact with each other through forums, emails and file sharing.
- Evaluation: testing students through quizzes and examinations and grading them.

**JUSUR System Architecture and Components**

Figure 2 shows a high level overview of JUSUR system architecture and its different modules interplay.

JUSUR is built using a Three-Tier Layer Architecture, which divides the LMS into three main layers, namely:

- Presentation Layer
- Business Layer
- Database Layer

**Fig 1: JUSUR logo**

**Fig 2: JUSUR System Architecture**
The presentation layer is responsible of communicating with other tiers by outputting results to the browser/client and interacting with the user. The business layer is responsible of controlling the LMS functionality by performing detailed processing, and the database layer is responsible of storing and retrieving data from the database and keeping data neutral and independent from business layer.

JUSUR is also implemented using the LAMP open source software bundle, which uses the Linux operating system, PHP language, MySQL database and Apache web server. Moreover, JUSUR has a learning content management system (LCMS), which is a system that can access learning object repository and enable subject matter experts, with little technology expertise, to design, create, deliver, and measure the results of e-learning courses rapidly.

**JUSUR Main Components**

The three core modules (i.e. components) in JUSUR LMS include: the site management, the user management and the course management.

**Site Management**

This module is responsible of managing and maintaining JUSUR LMS, setting up user accounts and customizing the site colors, fonts and layout.

For each university, the instructors and students’ full names and IDs are populated into JUSUR database prior to the commencement of the academic year. This is done as part of the agreement between the National Center and HE institutes in Saudi Arabia.

**User Management**

JUSUR users can be divided into ten types, namely: Students, Subject Matter Expert (SME), Academic Staff, Alumni, Consultants, Guest, Instructor, Part Time Academic, Staff and none. Each user type has its own dedicated role. For example instructors can enroll students manually or in batch (using a CSV file) to their courses. Instructors also can create courses, teach in them, and assign others to instructors’ roles.

Each registered person requires only one account for the whole system, and each account can have different roles, depending on the enrolled course.

**Course Management**

JUSUR provides a set of course activities such as: Announcements, Forums, Quizzes, Glossaries, Resources, Surveys, Assignments and Chats. Most of these activates requires a form of data entry that can be edited using a WYSIWYG editor.

Furthermore, instructors can selectively release assignments, assessments, and announcements based on specific start and stop dates. Instructors can also create quizzes with different types of questions, which include: Multiple choice, Multiple answer, Ordering, Fill-in the blank, Survey questions and Essay. All grades for Forums, Quizzes and Assignments can be viewed directly in one page or they can be downloaded as a spreadsheet file.

Instructors can share content with other instructors and students through a central learning objects repository. Instructors also have full control over their courses (accepting new students, adding students/instructors, deleting students, etc). They can also set students into groups.

**Other Features**

Recently, JUSUR has been integrated with Google Applications (Google Apps) so that it can provide the user (instructor/student) with a suite of Web 2.0 technologies such as personal email, interactive calendar, online documents and customized start page.

Additionally, JUSUR User Interface (UI) is available in both Arabic and English. Institutions can create their own look and feel templates across the entire system, including
their own institutional logos, headers, and footers. Also the instructors can change the order and name of menu items for a course. However, the default aesthetics of JUSUR UI is simple and the colors are appealing (see figure 3).

Finally, JUSUR provides an online technical support which responds to users’ problems in a timely fashion. Also Arabic documentations on how to use JUSUR (for both instructors and students) are available online.

**JUSUR Adoption and Uptake**

Since JUSUR launch in 2007, many Saudi Arabian higher education institutes have signed an agreement with the National Center of E-Learning and Distance Learning to provide them with LMS solutions. These nine universities and colleges include:

1. Islamic University,
2. Umm-Alqura University,
3. King Saud University,
4. Al-Baha University,
5. Al-Jouf University,
6. Taif University,
7. Qassim University,
8. Hail University,
9. Taibah University, and

However, a recent statistics provided by the National Center of E-learning and Distance Learning shows that three universities are currently using JUSUR (table 1).

<table>
<thead>
<tr>
<th>University Name</th>
<th>No. Students</th>
<th>No. Faculty</th>
<th>No. Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taibah University</td>
<td>312</td>
<td>16</td>
<td>17</td>
</tr>
<tr>
<td>Qassim University</td>
<td>483</td>
<td>17</td>
<td>1</td>
</tr>
<tr>
<td>King Saud University</td>
<td>5251</td>
<td>60</td>
<td>79</td>
</tr>
</tbody>
</table>

Table 1: Current use of JUSUR by different SA universities (date Nov. 2008)
Although these numbers do not show whether these courses are active or not, yet, this gives a good indication of the level of acceptance to shift towards e-learning solutions in Saudi Arabia HE institutes.

In addition, a recent case study presented at the fifth national medical services conference by Alrumaih (2008) shows the uptake of JUSUR at Prince Sultan Military College of Health Sciences. JUSUR was used to conduct online discussion and quizzes, submit homework and disseminate lecture notes among female students enrolled in the Pharmacology course at the nursing department. Overall the students’ level of satisfaction was very high given the problems of accessing the Internet in Saudi Arabia (Alrumaih, 2008).

Lastly, another evaluation is currently undertaken this academic year by the paper author to evaluate the functionality, usability and efficiency of JUSUR both from the instructor side and the students’ side. However, the detailed evaluation will be reported in a national conference.

**Comparing JUSUR to other LMSs**

To know whether JUSUR is competing in the era of divers open source LMS solutions. We used an online tool called (Edutools.info) to compare JUSUR functionality against two major open source LMSs, namely: ATutor 1.5.4 and Moodle 1.9.

The comparison is based on a high-level distinction between the three LMS functionalities, where (✔) means good implementation of the functionality, while (⊙) means fair implementation and (⊗) means poor implementation.

<table>
<thead>
<tr>
<th>Functionality</th>
<th>ATutor</th>
<th>JUSUR</th>
<th>Moodle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication Tools</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Discussion Forum</td>
<td>⊗</td>
<td>⊗</td>
<td></td>
</tr>
<tr>
<td>File Exchange</td>
<td>⊗</td>
<td>⊗</td>
<td></td>
</tr>
<tr>
<td>Chat</td>
<td>⊗</td>
<td>⊗</td>
<td></td>
</tr>
<tr>
<td>Whiteboard</td>
<td>⊗</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Internet Email</td>
<td>⊗</td>
<td>⊗</td>
<td>( via third party tools)</td>
</tr>
<tr>
<td>Test/Quiz types</td>
<td>⊗</td>
<td>⊗</td>
<td></td>
</tr>
<tr>
<td>Online marking tools</td>
<td>⊗</td>
<td>⊗</td>
<td></td>
</tr>
<tr>
<td>Online grade book</td>
<td>⊗</td>
<td>⊗</td>
<td></td>
</tr>
<tr>
<td>Course management</td>
<td>⊗</td>
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</tr>
<tr>
<td>Student tracking</td>
<td>⊗</td>
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</tr>
<tr>
<td>Accessibility</td>
<td>⊗</td>
<td>N/A</td>
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<td>Course Delivery Tools</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course management</td>
<td>⊗</td>
<td>⊗</td>
<td></td>
</tr>
<tr>
<td>Student tracking</td>
<td>⊗</td>
<td>⊗</td>
<td></td>
</tr>
<tr>
<td>Accessibility</td>
<td>⊗</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Content Development Tools</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Content sharing/reuse</td>
<td>⊗</td>
<td>⊗</td>
<td></td>
</tr>
<tr>
<td>Instructional design</td>
<td>⊗</td>
<td>⊗</td>
<td></td>
</tr>
<tr>
<td>compliance</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2, summarizes some of the compression criteria produced by the Edutools service, this includes: communication tools, course delivery tools, and content development tools. Other criteria results can be found in (9).
From the table above we can see that JUSUR LMS lags behind ATutor and Moodle in terms of accessibility and whiteboard support. However, JUSUR score was almost fair in the rest of the functionalities. This result indicates that JUSUR requires more improvements to compete with the major open source LMSs. Nonetheless, the result is natural, given the short time JUSUR has been introduced and used.
Conclusion

The use of LMSs inside higher education institutes are expected to grow in popularity in the coming years. This paper presents an overview of the development and the features of JUSUR LMS.

The team operating and developing JUSUR are currently getting feedbacks from the current users of the system and prioritizing the list of new features to be implemented. Also another team is doing research on what is new in learning management systems to be included in the next version of JUSUR. They also are working on making JUSUR capable of handling plug-ins to allow universities add their own added functionalities and features (Anwar Al-Yafi, Personal communication, 2008).

On the other hand, another team is working on getting other systems like the National Learning Object Repository (NLOR) integrated with JUSUR. Furthermore, e-Courses will be built with the help of SMEs from Saudi universities then they will be uploaded to JUSUR. This step will make e-Courses available to any lecturer registered in the system.

In conclusion, JUSUR LMS is still in its infancy, it requires a lot of testing and evaluation to reach the state of a full-fledged LMS. However, the current uptake of JUSUR among some HE institutes in Saudi Arabia shows a common passion with HE stakeholders to convert to E-Learning solutions.
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The Effect of Learning Style and Motivation on EFL Achievement in Virtual Learning Environments

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Abstract
The aim of this research was to study the effect of learning style and motivation as psychological traits on EFL achievement test in Virtual Learning Environments (VLE) and the relationship between these two variables. One hundred subjects who were participated in this study were chosen randomly from among e-learners of Khaje Nasir Toosi University of Technology (KNTU) of whom 60 students (26 female and 34 male) filled in the questionnaires completely and became our final sample. The instruments for assessing learners' motivation and learning styles were two standardized questionnaires namely, Academic Motivation Scale (AMS) and Eysenck Personality Questionnaire (EPQ) which were sent to the subjects via e-mail. The results of the study based on correlational techniques and chi-square tests showed that a significant relationship exists between learning style and scores but no link is reported between motivation and scores in the one hand and motivation and learning style on the other hand.

Keywords: VLE, Learning style, Motivation, EFL achievement.

Introduction
Nowadays the impressive and overall influence of technology on all aspects of our life generally and on communication specifically is inevitable. In step with such influence of technology, presence of computer and thereby personal ones combined with internet have accelerated far reaching changes in societies. As soon as the rapid changes or according to the most researchers "revolution" of technology took place, its potential as an aid to facilitate teaching and learning process has been reinforced. In fact, education and technology are mingled together and in the meantime learning has gained new meaning by taking the prefix "e" that has clarified the mastery of electronic potentiality. Obviously E-learning is one of the most popular and brand concepts provided by the internet.

According to d'Entremont (2004, p.1) "as Electronic learning takes place in network based environment, the educational environment is in constant dynamic change. The number of technology based courses, and the integration of technology into more traditional core courses is evident in both theory and practice".

Teaching and learning process via computer and web, from the view point of some researchers, has been considered as a variety of distance education seeing that there usually is some distance between teachers and students. Keegan (1999) believed that "Web-based education is a subset of distance education and those skills, literature, and management decisions developed within distance education are applicable to web based education as well" (as cited in Al-Othman, 2004, p.38). Besides, Yucel (2006,
p.2) stated: "E-learning, as a new version of distance learning, is applied via the Internet technologies and involves the educational activities, which do not require the presence of the teacher and learner at the same time and place".

Furthermore, we know that through e-learning teachers and students communicate virtually and this is the first and predominant feature of such a learning process that makes it different from traditional classes in which instructors and learners have face to face interaction. Hence, some researchers by reliance on virtual nature of such a process called it "virtual learning" and the setting through which the teaching/learning process is administered has been called "Virtual Learning Environment" (VLE). Kynäslahti (2001) made an extensive study into the meaning of the word "virtual", he noted that "when we say today that something is virtual, we assume that information and communication technologies are heavily involved in what we are talking about" (as cited in Mäkinen, 2002, p.9). According to Selverian, Hwang & Mason (2001), "an increasingly popular, prevalent and wide-reaching form of two-way interactive technology-mediated educational experience often called the Virtual Learning Environment (VLE)".

In general, a broad terminology describing learning process by applying various computer based technologies has been appeared along with the rapid growth of ICT (Information and Communication Technology) companionship in educational settings. The most widespread terms are E-learning, computer-based learning, distance learning, e-learning, internet based learning, online learning, resource-based learning, technology-based learning, web-based learning, assisted learning, MLE that is Managed Learning Environment, Blackboard, and Cyber University as well as virtual learning, which sometimes are used interchangeably.

Considering the importance of employing ICT in training sites, it can be claimed that nowadays VLE allows pedagogical models of learning and teaching at the college or higher education settings to be applied online. "The mere existence of ICTs has helped in the development of teaching technology applications" (Mäkinen, 2002, p.3).

Moreover, Alavi & Leidner (2001, as cited in Albritton, 2005, p.1) emphasized that "Over the past decade, a major paradigm shift in education has occurred, with a prominent change toward the expansion of virtual course offerings in universities, also called distance or outreach learning".

E-learning, regardless of its short age has many proponents who surveyed around its advantages. For example, Hill (1997, as cited in Delialioglu, n.d.) stated that "the major advantage of WBI [Web Based Instruction] was stated as being able to communicate with any person and/or access many resources independent from time and distance" (p.265).

Recent history of language teaching emphasis that English courses were not an exception to be taught virtually, as Jarvis (2005) declared "English Language Teaching (ELT) has been with us for many years and its significance continues to grow, fuelled, partially at least, by the Internet"(¶ 2).

Second language learning has always been a complicated and disputable topic which is related to various factors, including neurological, biological, sociological, psychological, and so on. To find out the factors affecting second language learning and the possible ways of facilitating students' second /foreign language learning, numerous researches have been conducted to discover the factors involved in ESL/EFL learning, such as gender, age, culture, identity, the emotional factors, learner variables, and so on. As we know, learner's characteristics have been important factors to be considered in
relation to second /foreign language learning; moreover, investigation of their impact on learners' achievement is of concern too. Among those characteristics or learner variables are Motivation and Learning style which are dealt with in virtual environments through the present study.

It is easy in second language learning to claim that a learner will be successful with the proper motivation. Such claims are of course shown that motivation is a key to learning. According to Imsen (1992, as cited in Hofsøy, 2001), "learning and motivation are inextricably woven together. L2 learning is no exception. There is a widespread recognition that motivation is of great importance for successful L2 acquisition".

Also, in Virtual Learning Environments or E-learning centers one of the important factors which affect learning process is the source of motivation of students. "The scientific concept of "motivation" has a long history. Some early theorists have traced it back to Plato and Aristotle, who discussed "willingness". In nineteenth century, scholars associated motivation with will, volition, or instinct, depending on how deterministic their worldview was" (Pintrich & Schunk, 1996, as cited in Kelly, n.d.).

Beside different definitions of motivation, educational psychology has identified two basic classifications of motivation – intrinsic and extrinsic- which is the main focus of present study. According to Kirk (2008)," intrinsic motivation arises from a desire to learn a topic because of an inherent interest, for self-fulfillment, enjoyment and to achieve a mastery of the subject. Students who are very grade-oriented are extrinsically motivated; on the other hand, students who seem to truly seize their work with a real interest in it are intrinsically motivated. Extrinsic motivation is motivation to do and succeed for the sake of carrying out an exact result or outcome". However, based on Timmis & Cook (n.d. p.73) "there is very little evidence that institutions are giving enough consideration to the student perspective and in particular the issues of motivation and engagement".

On the other hand a number of researchers believed that students with different learning styles do variously in different learning environments. Gregorc (1979) defined learning style as "a manner in which learners consistently respond to and process information in a learning environment, and is thought to be an individual characteristic that does not change over time"(as cited in Zwyno, 2002, ¶ 6).

"Everyone has their own "style" for collecting and organizing information into useful knowledge, and the online environment can be particularly well suited to some learning styles and personality needs" ("Learning styles", 2007, ¶ 1).

Zwyno (2002), quoted from Gardner (n.d.) that "students learn in diverse ways and instructors should value and nurture that diversity by attempting to address their individual learning styles and needs in the preparation and presentation of the material they teach".

Extroversion and Introversion are terms used to gauge two styles of learning. "Extrovert characters tend to be gregarious, while the introverted tend to be private. The activity of the extrovert is often seen as usually directed towards the external world and that of the introvert inward upon himself or herself" (Infoplease, 2003, as cited in Al Shalabi, 2003, p.23).

In conclusion, studies imply the importance of providing virtual learning environments with proper instructional design to accommodate with different psychological traits to achieve the desired educational outcomes accordingly.

**Purpose of the Study**

The purpose of this study was to (a), identify whether performance on achievement tests in
a course delivered online is related to extroversion and introversion as learning styles of the students; (b) determine if any relationship between scores on achievement test in the course delivered in an online environment and Extrinsic and Intrinsic motivation of the students exists; and (c) recognize the relationship between motivation and learning style on achievement test.

Questions of the Study

The questions that this study seeks to answer are as follows:

1. Is there any relationship between scores on achievement test in the course delivered in an online environment and the learning style of the students? (here the major focus is on Extrovert vs. Introvert)

2. Is there any relationship between scores on achievement test in the course delivered in an online environment and motivation of the students? (here the major focus is on Extrinsic vs. Intrinsic)

3. Is there any interaction between motivation and learning style?

Methodology

Subjects

In this study we had a target population of 520 B.S. students majoring in Industrial and Computer engineering who studied through virtual education at almost all courses including English, in E-learning center of Khaje Nasir Toosi University of Technology (KNTU). To ensure that each member of the population has an equal chance of being selected, they were chosen randomly. The subjects who participated in this study were 100 learners of whom 60 students filled in the questionnaires completely and became our final sample. Thirty four subjects were male and 26 were female. Age of the subjects ranges from 19 to 35.

Instrumentation

The instruments used to measure the different variables of the study included the standard Academic Motivation Scale (AMS) which is applied to collect data on students' language learning motivation. The standardized Eysenck Personality Questionnaire (EPQ) was also used to estimate language learning styles. Besides, students' scores on achievement test were obtained to evaluate the materials which were covered through the course.

Procedure

Two standardized questionnaires namely, AMS and EPQ were utilized to establish the independent variables. These questionnaires were sent randomly to 100 subjects who have taken online classes in KNTU (Khaje Nasir Toosi University of Technology) E-learning center; individual students are not identifiable and individual responses are not presented; aggregate information was used to draw conclusions and recommendations, and it was all done via email. All students were given time to complete each instrument. A total of 60 students completed both questionnaires. Later on 60 subjects were classified into related groups. On the basis of aforementioned classifications, after excluding the subjects who did not belong to none of the groups of our investigation namely, intrinsic/extrinsic with regard to motivation and extrovert/introvert regarding learning style, just 22 persons were left who were sited in the scope of our study.

Academic achievement which is the dependent variable of the present study was measured via final examinations. Students' course grades were obtained directly from the instructors who taught the courses.

Statistic Treatment

In order to examine the research hypotheses, the input data were analyzed through
Correlational analyses, technique of Pearson Chi-square, Fisher's exact test, and Lambda.

**Findings**

To follow the aim of the study which is a three folded perspective different statistical procedures were employed to analyze collected data. To answer the first research question that probes to find any probable relationship between the scores on achievement tests in a course delivered in an online environment and the learning style of the students, correlational techniques namely, Pearson Correlation, Kendall, and Spearman analyses were applied. The magnitude of Pearson Correlation (-.452) within 95% confidence interval (p < .05) for two-tailed test (significance = .035) indicates that there is a significant relationship between learning style and scores in virtual learning environment. The measures of other correlational analysis (that is, Kendall's tau = -.415, Sig. = .028 and Spearman's rho = -.479, Sig. = .024) also confirmed the existence of such a relationship (Table 4.1).

<table>
<thead>
<tr>
<th>Variables</th>
<th>Correlational techniques</th>
<th>Correlation coefficient</th>
<th>Sig. (2-tailed)</th>
<th>correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning Style</td>
<td>Pearson Correlation</td>
<td>1</td>
<td>.035</td>
<td>-.452*</td>
</tr>
<tr>
<td>Scores</td>
<td>Kendall's tau_b</td>
<td>1.000</td>
<td>.028</td>
<td>-.415*</td>
</tr>
<tr>
<td></td>
<td>Spearman's rho</td>
<td>1.000</td>
<td>.024</td>
<td>-.479*</td>
</tr>
<tr>
<td>N</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4.1: Correlation between learning style and scores

*Correlation is significant at the 0.05 level (2-tailed)

By rejecting the first null hypothesis: (1) there is no relationship between the scores on the achievement test in the course delivered in an online environment and the learning style of the students; the researcher studied the two subscales of learning style to explore whether extroverts were more successful on achievement tests or introverts. In order to do this, the computed means of scores for each group (extrovert and introvert) were compared through T-Test (Table 4.2).

<table>
<thead>
<tr>
<th></th>
<th>F</th>
<th>Sig.</th>
<th>t</th>
<th>df</th>
<th>Sig.(2 tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equal variances assumed</td>
<td>.033</td>
<td>.857</td>
<td>2.268</td>
<td>20</td>
<td>.035</td>
</tr>
<tr>
<td>Equal variances not assumed</td>
<td>2.270</td>
<td>19.351</td>
<td>.035</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4.2: T-Test statistics (independent sample test)

The measure of computed t (= 2.268, df = 20, sig.2 tailed = .035) indicated that there is a difference between two sets of means, in other words extroverts and introverts operated differently in virtual classes. Therefore, by considering the means of scores, the researcher found that extroverts were more successful (with the mean of 14.04) than introverts (with the mean of 11.75) as illustrated in Figure 4.1.
The second research question of present study surveys any association between the scores on achievement test in the course delivered in an online environment and motivation of the students. As remarked in Table 4.3 computed Pearson Correlation between motivation and scores of learners is .271 at the significance level of $p < .05$ for two-tailed test. Consequently, the second null hypothesis: (2) there is no relationship between the scores on the achievement test in the course delivered in an online environment and the motivation of the students, was admitted because of the lack of relationship between these two variables. Other correlational techniques (like Kendall's tau=.215, Sig. =.255 and Spearman's rho=.248, Sig. = .265) confirmed the nonexistence of the link too.

<table>
<thead>
<tr>
<th>variables</th>
<th>Correlational techniques</th>
<th>Correlation coefficient</th>
<th>Sig. (2-tailed)</th>
<th>correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motivation scores</td>
<td>Pearson Correlation</td>
<td>1</td>
<td>.223</td>
<td>.271</td>
</tr>
<tr>
<td>Kendall's tau</td>
<td>1.000</td>
<td>.255</td>
<td>.215</td>
<td></td>
</tr>
<tr>
<td>Spearman's rho</td>
<td>1.000</td>
<td>.265</td>
<td>.248</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>22</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

To investigate the relationship between motivation and learning style, Chi-square tests were applied. The amount of Chi-square tests which are listed in Table 4.4 showed that within 95% confidence interval ($p < .05$), no relationship exists between the two variables, so the third null hypothesis: (3) there is no interaction between learning style and motivation, is confirmed.
<table>
<thead>
<tr>
<th>Test</th>
<th>value</th>
<th>df</th>
<th>Asymp.Sig. (2- sided)</th>
<th>Exact Sig. (2- sided)</th>
<th>Exact Sig. (1- sided)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pearson Chi-square</td>
<td>.566</td>
<td>1</td>
<td>.452</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Continuity Correction b</td>
<td>.86</td>
<td>1</td>
<td>.770</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Likelihood Ratio</td>
<td>.565</td>
<td>1</td>
<td>.452</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fisher's Exact Test</td>
<td></td>
<td></td>
<td>.652</td>
<td>.384</td>
<td></td>
</tr>
<tr>
<td>Linear- by -Linear Association</td>
<td>.540</td>
<td>1</td>
<td>.462</td>
<td></td>
<td></td>
</tr>
<tr>
<td>N of valid cases</td>
<td>22</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Conclusion

"In today's world we don't just live, we 'e-live'. E-living is a term coined to imply the permeation of technology into all walks of life" Suresh (2005, p.2).

As a matter of fact, it is a norm that in step with emerging a new phenomenon, researchers want to answer many questions which arise in relationship with other experiences but by referring to the studies around E-learning or virtual learning, it seems that since the technology and the appeal for the virtual learning technique is outgrowing, many researchers have tried to study different aspects of this new field. There are several surveys around VLEs in the area of computer both software and hardware and also Information Technology (IT), but regardless of the significance of psychological factors which definitely affect learning process, few experiments have been carried out to determine if internet-based courses are affected by these elements.

The intention of this research was to use the outcomes of the study to help the framework of virtual education which currently needs ongoing development of the e-learning strategies within organizations in Iran. Considering the results of the study we found that individual students learn differently (they have different learning styles), so the extent of their success in their achievement will be dissimilar and remarkable. Obviously being aware of the relationship between different learning styles and the amount of achievements in VLEs will be useful to clarify the amount of each individual success in virtual education. In other words, educators and material designers can make changes in courses to accommodate the contents with all different learning styles and have better results in E-learning centers.

By implication and re-evaluation of the related policies it is likely to meet the expectation of future online learners and also diminish pedagogical complexities of using VLE. In analyzing online learning, designers need to learn and understand more about how learners interact with the media and how the web affects the learning outcomes. Of course, focusing on desired learning outcomes should be the ultimate goal of developing successful online learning systems.

Before closing, it worth to mention that despite the widespread requests to learn through virtual classes, studying around VLE in EFL teaching learning models is an almost intact area in Iran and more investigations in this fresh area is needed.
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Appendix A:

Academic Motivation Scale (AMS-C 28) College Version

*Why do you go to college (CEGEP)?*

Using the scale below, indicate to what extent each of the following items presently corresponds to one of the reasons why you go to college (CEGEP).

<table>
<thead>
<tr>
<th>Does not Correspond at all</th>
<th>Corresponds a little</th>
<th>Corresponds moderately</th>
<th>Corresponds a lot</th>
<th>correspond exactly</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

*WHY DO YOU GO TO COLLEGE (CEGEP)?*

1. Because with only a high-school degree I would not find a high-paying job later on.  
   1 2 3 4 5 6 7

2. Because I experience pleasure and satisfaction while learning new things.  
   1 2 3 4 5 6 7

3. Because I think that a college (CEGEP) education will help me better prepare for the career I have chosen.  
   1 2 3 4 5 6 7

4. For the intense feelings I experience when I am communicating my own ideas to others.  
   1 2 3 4 5 6 7

5. Honestly, I don't know; I really feel that I am wasting my time in school.  
   1 2 3 4 5 6 7

6. For the pleasure I experience while surpassing myself in my studies.  
   1 2 3 4 5 6 7

7. To prove to myself that I am capable of completing my college (CEGEP) degree.  
   1 2 3 4 5 6 7

8. In order to obtain a more prestigious job later on.  
   1 2 3 4 5 6 7

9. For the pleasure I experience when I discover new things never seen before.  
   1 2 3 4 5 6 7
10. Because eventually it will enable me to enter the job market in a field that I like.

11. For the pleasure that I experience when I read interesting authors.

12. I once had good reasons for going to college (CEGEP); however, now I wonder whether I should continue.

13. For the pleasure that I experience while I am surpassing myself in one of my personal accomplishments.

14. Because of the fact that when I succeed in college (CEGEP) I feel important.

15. Because I want to have "the good life" later on.

16. For the pleasure that I experience in broadening my knowledge about subjects which appeal to me.

17. Because this will help me make a better choice regarding my career orientation.

18. For the pleasure that I experience when I feel completely absorbed by what certain authors have written.

19. I can't see why I go to college (CEGEP) and frankly, I couldn't care less.

20. For the satisfaction I feel when I am in the process of accomplishing difficult academic activities.

21. To show myself that I am an intelligent person.

22. In order to have a better salary later on.

23. Because my studies allow me to continue to learn about many things that interest me.

24. Because I believe that a few additional years of education will improve my competence as a worker.
25. For the "high" feeling that I experience while reading
about various interesting subjects.  1  2  3  4  5  6  7

26. I don't know; I can't understand what I am
doing in school.  1  2  3  4  5  6  7

27. Because college (CEGEP) allows me to experience a
personal satisfaction in my quest for excellence
in my studies.  1  2  3  4  5  6  7

28. Because I want to show myself that I can succeed
in my studies.  1  2  3  4  5  6  7

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Caroline B. Senécal, Évelyne F. Vallières, 1992
Appendix B:

EPQ Short Scale

_Eysenck Personality Questionnaire_

Please answer each question by circling the YES or NO following the question. There are no right or wrong answers, and no trick questions. Work quickly and do not think too long about the exact meaning of the questions.

1. Does your mood often go up and down? Yes No
2. Do you take much notice of what people think? Yes No
3. Are you a talkative person? Yes No
4. Do you even feel ‘just miserable’ for no reason? Yes No
5. Would being in debt worry you? Yes No
6. Are you rather lively? Yes No
7. Are you an irritable person? Yes No
8. Would you take drugs that may have strange or dangerous effects? Yes No
9. Do you enjoy meeting new people? Yes No
10. Are your feelings easily hurt? Yes No
11. Do you prefer to go your own way rather than act by the rules? Yes No
12. Can you usually let yourself go and enjoy yourself at a lively party? Yes No
13. Do you often feel ‘fed-up’? Yes No
14. Do good matters and cleanliness matter much to you? Yes No
15. Do you usually take the initiative in making new friends? Yes No
16. Would you call yourself a nervous person? Yes No
17. Do you think marriage is old-fashioned and should be done away with? Yes No
18. Can you easily get some life into a rather dull party? Yes No
19. Are you a worrier? Yes No
20. Do you enjoy cooperating with others? Yes No
21. Do you tend to keep in the background on social occasions? Yes No
22. Does it worry you if you know there are mistakes in your work? Yes No
23. Would you call yourself tense or ‘highly-strung’? Yes No
24. Do you think people spend too much time safeguarding their future with savings and insurance? Yes No
25. Do you like mixing with people? Yes No
26. Do you worry too long after an embarrassing experience? Yes No
27. Do you try not to be rude to people? Yes No
28. Do you like plenty of bustle and excitement around you? Yes No
29. Do you suffer from ‘nerves’? Yes No
30. Would you like other people to be afraid of you? Yes No
31. Are you mostly quiet when you are with other people? Yes No
32. Do you often feel lonely? Yes No
33. Is it often better to follow society’s rules than go your own way? Yes No
34. Do other people think of you as being very lively? Yes No
35. Are you often troubled about feelings of guilt? Yes No
36. Can you get a party going? Yes No
A Product-line Engineering Framework for Learning Objects

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Abstract

Software product line is gaining popularity over time due to its profound impact on the productivity of the software development process. The most important entity of the product line engineering is the product line architecture which highlights systematically commonality and explicit variant points. The product line architecture further supports efficient evolution of the product based on market demands of the business case. Learning objects can be defined along the three dimensions of pedagogy, technology and the domain. This paper presents a product-line engineering framework for learning objects using the ED2 model. The framework demonstrates the use of explicit variability definition in a learning object at various levels of the model including Site, Structure, Skin, Services, Space Plan and Stuff. The framework is validated against a commercial e-learning course in Six Sigma.

Introduction

Digital learning objects are a complex amalgamation of learning content, pedagogy and technology and represent the building blocks of any online course. While there are many views on what a learning object is (Wiley 2000; McGreal, 2004), in practice, a learning object typically contains learning objectives, reusable information objects and formative and/or summative assessments (Cisco, 2003). The reusable information objects can range from images, text or videos to games or simulations. Assessment objects, on the other hand, range from simple multiple-choice questions to adaptive testing techniques. Much like earlier days of object-oriented design, most discussions on learning objects have revolved around micro-level reuse; how to re-use a learning object in a different learning context. In the mean time, significant success has been achieved in macro-level reuse in the context of traditional object-oriented design. In specific, one promising area for macro-level re-use has been that of product-line engineering (Clements, 2001).

Recently, software development trends have caused single product development to evolve into “software product line architecture” (SPLA) which integrates lines of resulting products. The main objective of SPLA is to reuse the architecture for successive product development. Clements (2001) defines the term “software product line” (SPL) as a set of software intensive systems sharing a common, managed set of features that satisfy the specific needs of a particular market segment and are developed from a common set of core assets in a prescribed way.” The SPL is receiving an increasing amount of attention from software development organizations because of the promising results in cost reduction, quality improvements and
reduced delivery time. Clement et al. (2005) report that SPL engineering is a growing software engineering sub-discipline and many organizations, including Philips®, Hewlett-Packard®, Nokia®, Raytheon®, and Cummins®, are using it to achieve extraordinary gains in productivity, development time, and product quality. European researchers present many other corresponding terminologies for the SPL such as “product family”, “product population” and “system family”.

Since the acceptance of object-oriented paradigm in the early 1980’s, concepts of software architectures have evolved significantly. As Garlan and Perry (1995) point out, traditionally software architecture includes the structure of the components of a program or system, their interrelationships, and the principles and guidelines governing their design and evolution. However, more recently, software architecture is being restructured towards a SPLA, where the focus is not on single product development but rather on multiple product development. In a SPLA, all of the products share the same architecture. Pronk (2000) defines SPLA as a system of reuse in which the same software is recycled for an entire class of products, with only minimal variations to support the diversity of individual product family members. According to Jazayeri et al. (2000), SPLA defines the concepts, structures and textures necessary to achieve variation in the features of diverse products while ensuring that the products share the maximum amount of parts in the implementation. Mika and Tommi (2004) point out that SPLA can be produced in three different ways: from scratch, from an existing product group or from a single product. Hence, software product line architecture is an effective way to minimize risks and to take advantage of opportunities such as complex customer requirements, business constraints and technology.

**Research Motivations**

Digital learning objects are composite structure of learning content, pedagogy and technology. The use of the Internet further accelerates the popularity and significance of learning objects design and implementation at an unprecedented rate of growth. Conceptually different products using digital learning objects share commonality and variability up to certain extend. SPLA provides an opportunity to explicitly identify commonality and variability first at the architecture level and later at the implementation. Figure 1 shows the systematic view of generic product line architecture.

A well-established requirement management activity for the software product line assists in understanding the scope and boundaries of the products to be developed and it helps in establishing the underlying core architecture features in terms of functionalities and their structure. Product line requirements deal with features or functionalities common to all the products belonging to that family. Product line requirements are composed of a constant and a variable part. The constant part comes from product line requirements and deals with features common to all the products belonging to the family. The variable part represents those functionalities that can be changed to differentiate one product from another. This activity defines the variable part of the product requirement. The product commonality analysis provides a set of features that are common to all products, whereas product variability analysis identify explicit variation points where we can introduce changes to develop new set of products.
Since the popularity of both the use of digital learning objects and SPLA there is a need to establish a foundation for the learning objects to make use of SPLA in order to get benefits of the SPLA in terms of cost, quality and reduction of development time. The objective of this study is to investigate the architecture of learning object using ED2 model for the feasibility of constructing SPLA. This investigation will provide answer whether we can develop SPLA for digital learning objects to establish a product line or not. The study will concentrates in identifying core architecture features of digital learning objects along with explicit definition of commonality and variability.

The ED2 Model

The ED2 model for analyzing learning objects is presented in Zualkernan (2006; 2008). The ED2 model presents a comprehensive framework for thinking about variability and change in any learning object. The model has two dimensions. The first dimension views variability in terms of pedagogy, technology and domain of learning. The second dimension looks at variability from the perspective of architectural layers of a learning object.

The first dimension of the ED2 model deals with the three dimensions of pedagogy, technology and the domain. The first source of variability is the domain of learning where different types and levels of knowledge may be included in a learning object. Similarly, the second source of variability is the technological basis of a learning object; one may decide to use an HTML-based learning object as opposed to a Flash-based one, for example. Finally, the pedagogy underlying the learning object can vary from tell-and-test to a socio-constructivist framework emphasizing the social nature of learning.

The second dimension of the ED2 model deals with layers of change within a learning object. This dimension was originally conceived to think about layers of change in the field of architecture and later applied to learning objects (Brand, 1994; Gibbons, Nelson & Richards, 2000). Brand (1994) contends that a building can be viewed to consist of multiple layers that slide along each other. Each layer is designed to vary on a different time-scale. The layer that varies at the slowest speed is called the Site. This layer represents the physical location of a building and is consequently the most stable. The next level of variability is represented by the Structure of a building. The Structure may consist of the walls and roof of the building. In buildings, structures can last from 30 to 300 years and are hence less stable. Skin layer represents the exterior of a building and typically changes over a period of 20 years or
so. The infrastructure inside a building represents the Services layers. This may include lighting, air-conditioning and plumbing etc. Services typically change over a life-span of decades. The Space Plan layer consists of the internal walls and the layout of the building. This layer can be changed every few years or so. Finally, the Stuff layer represents what is inside a building. For example, furniture represents one type of stuff. Stuff can be changed on a weekly or monthly basis. For a learning object, ED^2 combines the two dimensions as described below.

**Site**

Technologically, Site represents a choice of the lowest virtual machine being used to deploy a learning object. For example, one could choose Windows operating system, Java virtual machine or Adobe Flash virtual machine as the Site. Pedagogically, Site represents choosing an epistemological orientation towards learning. For example, one could choose an instructivist or constructivist pedagogy. From the domain of learning, Site represents choosing what constitute fundamental and immutable principles of a domain; homeopathic verses allopathic, for example.

**Structure**

Structure from a technology perspective, involves choosing learning design architecture like SCORM (IMS-SCORM, 2005) or LD (IMS-LD, 2008). Pedagogically, the choice is about the nature of learning design; problem-based learning verses informal learning, for example. From a domain perspective, the choice is about embedding a particular domain ontology that emphasizes only particular views of a domain (Gomez-Perez., Fernandez-Lopez & Corcho, 2004).

**Services**

Choices in technology-oriented services in a learning object may include authentication, login, tracking, archiving, and book-marking. Choice in pedagogical services, on the other hand, is represented by a level of understanding being delivered by a learning object. For example, one may use Bloom’s taxonomy (Bloom, 1956) to specify that a learning object delivers a “recall” level of understanding as opposed to “analysis.” Domain services provide choices in learning objectives; what is to be learned in a learning object, for example.

**Space Plan**

Technologically, Space Plan of a learning object represents choices of personalization and customization. For example, the linear sequencing in SCORM (IMS-SCORM, 2005) supports a flexible Space Plan. Pedagogically, the Space Plan represents a choice on the degree of adaptive-ness of the learning design; does the learning object use learning styles and preferences to determine learning paths for individual learners? Domain-wise, a Space Plan represents choices regarding multiple types (or roles) of learners; is the learning object designed for a technician, an engineer or both?

**Skin**

Technologically, Skin of a learning object represents choices in user-interface technologies; HTML, DHTML, XUP or SVG, for example. Pedagogically, Skin represents the choice of a learning template. For example, Cisco’s methodology (Cisco, 2003) specifies that teaching a concept requires a definition, an example and a non-example. Domain-wise, Skin represents choices in presentation styles and colors; each domain has its own presentation norms.

**Stuff**

Technologically, Stuff represents choice or selection of specific assets (IMS-SCORM,
2005); text, PDF files, Flash movies and Java scripts, for example. Pedagogically, Stuff represents choices about including specific instances of pedagogical primitives like objectives, topics, lessons, assessments, games, simulations, and activities. Domain-wise, Stuff represents choices in which of the specific definitions, concepts, processes, and principles to include in a specific learning object.

**Product Line Architecture Analysis for Six Sigma Learning Objects: A Case Study**

This section describes an analysis of the product line architecture approach to creating learning objects for the Six Sigma quality methodology (Pyzdek, 2003). As a part of implementing Six Sigma within an organization, the Six Sigma training needs to be delivered at various levels for various stakeholders. The level of training can vary from yellow-belt training to black-belt or master black-belt training. Intermediate levels of green belt and orange-belt have also been introduced. In addition to various levels of training, the Six Sigma methodology has various variants like DMAIC (Define, Measure, Analyze, Implement and Control) or DFSS (Design for Six Sigma), for example. These variants can be further customized; some companies may choose to combine the Define step with Measure to just include MAIC. Another source of variability is the diverse set of conceptual and statistical tools that can be optionally used to implement this methodology; for example (George et al., 2005) lists about one hundred tools. The high variability in various aspects of a Six Sigma course makes it a good candidate for a SPLA. A business cases for this product line is clearly justified by the need for various specialized versions of yellow belt, green-belt and black-belt courses in Six Sigma.

Figure 2 shows a simplified feature model the six sigma course learning object in terms of ED2 model. The first variability is at the top level which is the training levels of six sigma courses of yellow, black, orange and green levels. The commonality exists at the six level of ED2 model which are Site, Services, Structure, Space plan, Skin and Stuff. In other words, any Six Sigma course must include (and choose) aspects from each of these six. Commonality management in software product line architecture deals with all product aspects that are common across all the various ED2’s categories. The structure of ED2 dictates that commonality should be high (less variability) at the lower layers (like the Site) and low (high variability) in the higher layers (like the Stuff). Commonality analysis ensures that the selections made for each layer of commonality according to the ED2 model are mutually consistent. For example, since a pure Flash framework was fixed for the Site, it is consistent with the Stuff being constrained to use common Flash buttons; a use of Windows buttons for the Stuff, would obviously be inconsistent. Detailed example of commonality among successive products of six sigma learning objects are shown in Table 1.
As opposed to commonality, variability explicitly models what can be changed. It highlights in the core architecture where we can introduce changes to come up with new products based on the business case. Again, ED2 provides a structured approach to identifying variability. The Figure 2 clearly highlights variations in features in terms of ED2 model. For example, in case of Structure some products may use SCORM and others may use LD. Whereas in case of Site, some product may use HTML, DHTML, or XUP. Like commonality analysis, variability analysis also needs to ensure that there are no contradictions. For example, the variability in the Services layer (no audio) is consistent with the Flash engine’s capabilities (to skip audio for a Tab) at the Site layer. Some more examples of variability analysis are shown in Table 2.

Figure 3 and 4 show screen shots for a yellow-belt and orange-belt modules as a part of two successive products that are developed from the Six Sigma courses software product line. These two products consist of sets of Adobe Flash modules that constitute each course. The commonality is present in all the six factors of ED2 model including Site, Structure, Services, Space plan, Skin and Stuff. Both courses use the same Adobe Flash Engine that interacts with a SCORM-based Learning Management System using and AICC interface to support authentication, tracking and book-marking services. Both products have the same look and feel in term of the various buttons and menus on the screen. Both products support pages and sub-pages and an audio interface.
### Table 1: Commonality Identification Examples

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Commonality Identification</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Site</strong></td>
<td>Use the Adobe Flash-based engine for all products. This engine defines a common virtual layer for all the products. The engine needs to support interface to a Learning Management System. In addition, the product will use a traditional teacher-centric pedagogy.</td>
</tr>
<tr>
<td><strong>Structure</strong></td>
<td>All products will contain modules where each module will present objectives, followed by a mix of information and assessment items, followed by a conclusion. Each product will support multiple learning styles by including images, text and audio. Each product will be structured to include sub-pages in the form of Tabs. Traditional Six Sigma methodology will be used (excluding Lean concepts).</td>
</tr>
<tr>
<td><strong>Services</strong></td>
<td>All products will have login, book-marking and audio services. In addition, all products will have a help facility.</td>
</tr>
<tr>
<td><strong>Space Plan</strong></td>
<td>All modules will have pages and each page will have tabs for sub-items within a page.</td>
</tr>
<tr>
<td><strong>Skin</strong></td>
<td>All products will carry the same broiler plate with the company’s logo. All products will have a forward-backwards button, an audio panel including on/off, pause and repeat buttons, a drop-down menu to access various pages of the product and a panel showing where the learner is (sub-page number) with respect to the complete module.</td>
</tr>
<tr>
<td><strong>Stuff</strong></td>
<td>All products will use common Flash buttons for forward and backwards, drop-down menus and Tab objects.</td>
</tr>
</tbody>
</table>

### Table 2: Variability Identification Examples

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Variability Identification</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Site</strong></td>
<td>Arbitrary Flash movies can be embedded within the generalized Adobe Flash engine. The pedagogy can be changed to emphasize problem-based learning in a social context.</td>
</tr>
<tr>
<td><strong>Structure</strong></td>
<td>The content inside each Tab in a product can be an arbitrary image, text or another Flash movie. The depth of content presentation can be varied for yellow to black-belt.</td>
</tr>
<tr>
<td><strong>Services</strong></td>
<td>Audio can be skipped for some tabs. Similarly, tracking is optional. The learning objectives are different for yellow or black-belt.</td>
</tr>
<tr>
<td><strong>Space Plan</strong></td>
<td>The placement of text, images, and movies within a Tab can be varied. In other words, different configuration of text, images and movies can be used. The order of modules and sub-pages to include will depend on whether yellow or black-belt training is being delivered.</td>
</tr>
<tr>
<td><strong>Skin</strong></td>
<td>Colors and look &amp; feel can be changed.</td>
</tr>
<tr>
<td><strong>Stuff</strong></td>
<td>All the content including text, images and specific audio is variable. The specific stuff to include will depend on which of the various levels of training is being imparted.</td>
</tr>
</tbody>
</table>
Fig 3: Screen shot of one module in a yellow-belt course  
Source: www.knowledgeplatform.com

Fig 4: Screen shot of one module in a black-belt Course  
Source: www.knowledgeplatform.com
The variability arises in the depth of the presentation content. As Figure 2 shows, the yellow-belt course is mostly descriptive and introduced Six Sigma at a basic level. The orange-belt course, on the other hand, goes into the details of technical analyses like gage analysis. There is variability from a presentation perspective as well. For example, in Figures 3 and 4, the yellow belt example shows a simple table while, in the orange-belt example, the three graphs can be selected one at a time by the user by clicking on it. There is also wide variability in the two courses with respect to the pedagogy. While the yellow-belt course relies primarily on tell and test (knowledge level, in terms of Bloom’s taxonomy), the orange-belt course uses scenario-based learning as well. For example, a culturally relevant example of how to select a mobile phone is used where the user can choose a particular mobile phone and try to understand the reasons behind their selection by using a factorial design approach.
Conclusion

Software products line engineering curtails the development time and further avoids reinventing the wheel in software development. Design and development of digital learning objects is gaining popularity due to significantly large increase in online learning. The objective of this study was to investigate the use of product line approach in developing digital learning objects. We analyzed the core architecture of digital learning objects in comparison to the theoretical foundations of software product line architecture. We found that development of digital learning objects can be further improved if we use the product line approach because it will reduce the development time and efforts. The product line approach further accelerates the design and development time by reusing the core functionalities in successive product and by identifying business cases variable features can be introduced to launch new products in shorter time frames thus satisfying the market demands. We are currently working on developing a software product line based process model for e-learning products.
References

An Evaluation of e-Learning at the University of Mauritius: The Case Study of the Virtual Center for Innovative Learning Technologies

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Abstract
This paper provides an overview of the current milestone in the evolution of eLearning courseware development and research at the University of Mauritius. The case of the Virtual Centre for Innovative Learning Technologies is presented and is used as an example to scale up into a regional open eLearning institution that will help Mauritius achieve its vision of being a knowledge hub for the region with particular emphasis on the export of human resource development services. In this endeavour, the role that open distance and innovative eLearning technologies cannot be overlooked as ICT has become a key emerging player and critical success factor for maintaining competitiveness in a globalised market environment. The paper provides some insights of the approach needed to scale up as well as provides highlights on issues that need to be addressed.

Introduction
During a recent two-day international symposium organised by the Board of Investment of Mauritius in collaboration with the Commonwealth Secretariat, the country was projected as having a high potential to become the Centre for Excellence for human resource development in Africa. Distance, Online Education and e-learning were consequently treated as one of the focus areas that needed to be explored in order to help the country achieve its objectives in a rapidly changing, evolving and competitive global marketplace. However, from the presentations in the symposium, it was noticed that the key player in eLearning in Mauritius is the Virtual Centre for Innovative Learning Technologies at the University of Mauritius. There may be other private institutions indulging in elearning but who might only be franchise companies of external institutions or who did not want to expose their competencies and experiences in a bid of protecting their business and trade secrets. The University of Mauritius therefore has the core competencies in terms of instructional and pedagogical design, multimedia development, eLearning platform hosting and management and content experts in a variety of fields. So far, the projects that have been carried out were designed and carried out in a closed prototyping environment with manageable cohort sizes. After 7 years of experimentation it is the prime time to scale up in a bid to make the country the regional knowledge hub, one the Government’s strategic vision for the “new” Mauritius.

This paper provides an overview of the evolution of e-learning at the University of Mauritius in terms of developed core competencies, research abilities, consultancy services. It discusses the issues and challenges that are still to be overcome to achieve the objectives and vision set by policy makers.
and authorities and provides some insights for the establishment of a viable framework and policy making to kickstart the elearning initiatives so far into the establishment of an elearning industry in Mauritius through an “online” open university for the region.

**Evolution of e-Learning at the University of Mauritius**

The University of Mauritius created in 1993 the Jay Baguant Centre for Distance Learning (currently known as the Centre for Professional Development and Lifelong learning) to deliver on-campus and off-campus distance education courses using the print-based medium. With the emergence of national information technology infrastructure such as wide scale access to the world wide web and broadband (not so broad) connections, the University created the Virtual Centre for Innovative Learning Technologies (VCILT) in 2001 to complement and provide value addition to the existing distance education services offered by the Centre for Distance Learning. The setting up of the VCILT in 2001 was in itself an innovative project for Mauritius and it is today recognised as the pioneer in the development and promotion of an elearning culture in the country. The VCILT was setup in the first instance as a service centre for academic staff wishing to put courses online. The three core services offered were pedagogical design and development, hosting and support, and the conduct of orientation sessions with the learners on the e-learning platform.

The first e-learning platform that was used was the Virtual-U which was a proprietary platform based on a weak traditional file systems architecture. The high cost of elearning platforms and the lack of the options of local hosting by elearning solution providers at that time, pushed the University towards the development of its own elearning platform in 2002. The i-learn (figure 1) platform was developed as part of the University’s strategy for undergraduate elearning courses.

![Fig 1: Snapshot of the i-Learn platform](image)

The first generation of elearning courses at the University following the classical “tell-and-ask” approach (Schneider, 2003). Contents were delivered online and students
were expected to click on the “next” or “back” button or use the table of contents to navigate through the contents. This activity was supported with simple communication tools like email and forums as well as classical multiple choice questions to supposedly improve the student’s learning experiences online.

In 2004, the University created the lifelong learning cluster which operates by federating the three centers who are the major stakeholders in distance, online and lifelong learning at the University. This enabled the lifelong learning cluster to operate as a faculty at the University therefore implying the delivery of courses and enrolment of research students at MPhil and doctorate level.

Following a number of workshops carried out by eminent researchers in the field of educational technology, important developments in terms of pedagogical design of courseware took place at the VCILT together with a change in direction in terms of technology and infrastructure as well as the overall philosophy governing the ongoing teaching and learning processes. The first major transformation occurred in the role of the center itself moving from a service centre to develop additional components in terms of research, consultancy and teaching. The centre launched its first online Masters programme (Santally, 2005; Santally & Raverdy 2006) in 2004 and four batches of approximately ten students per cohort have followed the course up to now. With the introduction of such a programme especially at Masters Level where the focus was mainly on a competencies-based approach and constructive learning, a new pedagogical approach had to be adopted. Two changes were made to support this endeavour. The Moodle e-learning platform was introduced and a new approach of pedagogical engineering of courses was adopted. The new approach was based on structured activity-based learning as it is postulated that through the classical face to face and elearning approach, students cannot apply knowledge acquired when they are on the field (figure 2) or at the workplace (Schneider, 2003). This has long been a criticism that the University had to face from potential and employers of the graduates of University of Mauritius.

Having adopted such a direction, the VCILT inevitably joined in the Ministry of Education to strengthen the linkage already made with the Commonwealth of Learning through the Virtual University for Small Island States of the Commonwealth (VUSSC) WikiEducator project (http://www.wikieducator.org). The use of the wiki technology is being favoured at the University in a number of modules to favour collaboration among learners, improve writing skills and promote a sharing culture among the educational community.
Existing Teaching and Research Frameworks @ the VCILT

Research at the Centre has been ongoing in the form of locally funded projects such as the development of an interactive multimedia CD-ROM for History and Geography targeted towards primary school learners. Research also took the form of reflective practices from field experiments in social work for instance. It also occurred as part of partnerships and collaboration with external institutions in the form of seminars, workshops and staff exchange programmes.

Participatory Action Research

Wadsworth (1998) focuses on the three main words participation, action, and research to define participatory action research. He argues that the concept can be described as a kind of social research per se (albeit social research which is more conscious of its underlying assumptions, and collectivist nature, its action consequences and its driving values). Furthermore this methodology faces numerous barriers to its practice, which mean that, even when we think we might be doing 'it', we often have doubts and that it involves more or less reflexive, skeptical and imaginative inquiry. The process of designing e-learning activities is a collaborative activity that involves more than one actor and each actor holds a role that is crucial to working towards a high quality product. This is the type of research approach that is currently needed in most educational research activities that focuses on reflective practices to improve current ones. The evolution of elearning at the University of Mauritius has occurred under such a research approach of successive iterative cycles of reflection-on-action processes to create subsequently improved ones.

Activity-Theoretical Approach

The activity theory is a general framework for studying different forms of human activity as development processes (Kuutti, 1996). Activity theory (figure 4) has been successfully applied in different research domains (Taurisson & Tchounikine, 2004; Korpela et al., 2001; Collins et al., 2001) as the main theoretical framework to model human activity systems and we demonstrate how it can be applied to the present local context.
Figure 3 illustrates the application of the activity-theory framework to the design of the current learning environment for the module. The outcome of the whole process is characterized through demonstration by the learner of the competencies he achieved during the course.

The object that the learner will work on becomes the learning activity governed by some general (fuzzy) rules. The learner has the support and interacts with the learning community that includes the lecturer, peers and other information sources. Most of the interactions that take place with the community are done via the virtual forums. Finally, the "instrumentation" of the activity is the key component to help the learner achieve the outcome; lecture notes, software tools and tutorials, communication tools like email, forums and to a less extent chats are available to the learner.

**The Role of Open Educational Resources**

The Virtual Centre for Innovative Learning Technologies has been an active player in the development, use and repurposing of Open Educational Resources. It has played significant roles in the Virtual University for Small States of the Commonwealth (VUSSC) through the contribution of materials to the WikiEducator platform and through training
and capacity-building workshops to sensitize people and to make them active “wikizens”. The Centre is also an active partner in the SIDECAP project, representing the University of Mauritius in an EDULINK-ACP funded research, lead by the Open University of the United Kingdom. The focus of the project is the use of Open Educational Resources in Education and the overall objective of the action is to promote multilateral activity amongst the European and ACP partners through practical activities, networking and hands-on exercises designed to improve the quality of teaching and support for students. Furthermore, the VCILT has established links with the African Virtual Open Initiative Resources (AVOIR) Project, which intends to build capacity in software engineering in Africa using Free Software (Open-Source) as the vehicle. The contribution towards the project has been both on academic and technical development; academic in the sense of postgraduate students working on research projects related to the usability, and pedagogical aspects of the software developed, and technical through the contribution of functional development of software modules.

**Export of Human Resource Expertise and Services in the form of Contract Research**

Given its expertise in e-learning and educational technologies, the VCILT has been involved on the regional level with the COMESA for the installation, deployment of e-learning platforms, as well as training of users for the instructional development of courseware for open and distance learning. Furthermore, short courses have been organised for Seychelles Islands in the same area where educators and policy makers were present. Other similar events took place in Botswana in partnership with the Centre for Activity Theory and Developmental Work Research of the University of Helsinki. In 2007/08 academic year, the VCILT was ranked as the third department (and being the smallest in staff size) of the University in terms of highest revenue from contract research consultancy.

**Capacity Building through the Masters in Educational Technology Programme**

In 2004, the VCILT launched the Masters programme in Computer-Mediated Communications and Pedagogies targeted mainly towards educators and training managers. The programme aimed to be a capacity building programme to expand the shell of e-learning expertise in a distributed manner throughout the educational system. This bottom-up approach was applied to create the critical mass of change agents to promote an innovative e-learning culture right from the primary education system to the tertiary level. In 2007, the programme was revamped and its name changed to Educational Technology. So far, about 40 change agents have been formed and the progress is not as expected for a number of reasons. While the cost element of the courses has always been a major constraint, the major reason remains the centralisation of educators’ training programmes at the level of the Mauritius Institute of Education.

**Barriers and Issues to be Addressed for Enhanced Sustainability**

**Mindsets**

So far, the main barrier concerning the adoption of elearning among academics of the University of Mauritius is the problem of not having the right mindset concerning this approach. This is a result of their lack of exposure and confidence to use ICT tools, thinking that they will need to devote much more time to this activity, and finally not finding obvious the reward of doing all these. It is also difficult for those who have always been teaching on a face to face basis to migrate to the network environment. Finally
some see it as a threat as this may benefit those who are most at ease with technology.

**Intellectual Property Issues**

The whole process of conception and delivery of an online distance education module involves a number of interdisciplinary expertise such as project management, instructional and pedagogical design, content experts as well as web designers and developers. The finished product is a medley of intellectual property of a number of individuals that add value to the raw subject matter content. Finding a consensus among all these stakeholders among how to deal with this matter has always been difficult in the local context.

**Policy Making and ICT Strategy**

Policies always provide the framework for something to happen. But along with policies, there need to be a clear operationalisation plan from top management to the execution level staff so that things really happen. There is also the problem of lack of clear ICT strategy that will support these initiatives. General ICT strategy does not suffice. Specific strategies need to be defined for specific projects depending on requirements.

**ICT Proficiency and e-Readiness**

Over the past eight years, the successive governments of the country have taken laudable initiatives to improve the literacy level of the population in ICT through the mass computer proficiency programme and the IC3 (Internet Core Computing Certification) programme. However, to inculcate an elearning culture among the public at large is a completely different and more complex issue than making them proficient in the use of IT tools. A completely new learning culture needs to be developed.

**Accreditation and Certification Issues**

Having internationally recognised and accredited programs with renowned institutions and professional bodies worldwide can help strengthen the strategy of Mauritius and its position as a regional knowledge for the African Region. Concerning the scaling up of the different initiatives of elearning and distance education towards a regional online ‘open’ university would also raise the issue of undergraduate and postgraduate degree awards. The question of whether the Open University will be an awarding body, or awards are either University of Mauritius, or University of Technology or specific strategic partners depending on the proportion of courses contributed in a particular programme, or the consortium will be awarding body or joint awards will be given need to be sorted out.
Conclusion

It is obvious that open, online and distance education supported by well-defined policies and strategies can play a major role in helping Mauritius achieve the vision of being a knowledge hub for the region through the exports of human resource development services. The paper shows that Mauritius, through a number of institutional initiatives has the potential, infrastructure and expertise to scale up. However, there are a number of important issues to be addressed before the implementation of a robust harmonized national framework which will be used to “operationalize” the policies and vision that have been laid out.
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The Use of Open Educational Resources in Courseware Design: Some Reflections in Action

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Abstract

Open educational resources are defined by the Wikipedia community as being basically content, instructional approaches, activities and other resources, available for free and that are believed to be useful in educational contexts. Over the recent past, there has been growing interests, activities and project funding in this area of web-based education. However, the process of authoring courseware is not as simple as it may seem and there is a need to adapt existing instructional and pedagogical design frameworks to cater for open resources. This paper presents a case study of the conception of a module using open educational resources. An iterative process model emerges which obviously needs further refinements. It is also found that in some cases the use of open resources for courseware authoring can result in a more time-consuming process and that depending on the approach used, different process models may be applicable.

Keywords: Reusable learning objects, Open Education Resources, Courseware Design, Instructional Design

The World Wide Web and e-Learning 2.0 Concepts

The evolution of the Arpanet into the internet and the subsequent widespread access to the information superhighway has changed the shape of both distance education and traditional learning. The Web 1.0 provided essentially a new medium for the delivery of information, as well as providing access to a wealth of information in a relatively short period of time to those who have access to it. This approach limited interactivity as the internet surfer was mainly seen as a consumer of information. With the emergence of Web 2.0, that is, more collaborative platforms such as Wikipedia, discussion forums, and online communities of practice, blended with more sophisticated web-based multimedia communication tools, information consumers have also started to “produce” information. Consequently, teaching and learning on the Internet started to undergo some new conceptualisation and the change was reflected in a growing need for educators and researchers to come up with innovative pedagogical methods and design approaches to make teaching and learning more interesting online (Nichols 2003). Contemporary researchers in educational technology therefore shift their focus mainly on the use of the Internet infrastructure to implement new learning paradigms grounded in more socio-constructivist settings. They insist that the Internet should not be used as only a medium for delivery of electronic materials but should viewed as a medium that supports new learning paradigm, pedagogies and instructional approaches and that facilitates the construction and application of knowledge through authentic and collective activities (Schneider, 2003). While the web is no longer being viewed and utilized as solely a different medium for delivery, it has
become the vehicle for a number of innovations in the educational arena, with more and more contents being made freely available online. It has also created new implications in terms of intellectual property, copyright laws and also on institutional practices and policies (Schmoller et al., 2007).

**The World Wide Web and e-Learning 2.0 Concepts**

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**An Overview of Open Education Resources**

Open educational resources are defined by the Wikipedia community as being basically content, instructional approaches, activities and other resources, available for free and that are believed to be useful in educational contexts. The idea behind the concept is to promote access to education to a wider audience, especially those from deprived regions of the world, where the open resources can be freely reused, improved and repurposed to fit in different contexts. Open-education resources are basically everything that can be categorized as learning objects. However, from working definitions and metadata standards that exist, a learning object can also be proprietary and copyrighted.
Open Education Resources, a term first used at the 2002 UNESCO Forum on the impact of open courseware for higher education in developing countries is “an Internet empowered worldwide community effort to create an education commons”. This implies that the educational materials and resources can be offered freely and openly for anyone to use and under some licenses to re-mix, improve and redistribute.

The list given in Figure 2 is of course non-exclusive and can concern other broader items like open-source software released in the public domains. Open Education Resources are considered the building blocks of the concept of Open Education, defined as collective term that refers to forms of education in which knowledge, ideas or important aspects of teaching methodology or infrastructure are shared freely over the internet (Source: http://www.wikipedia.org).

**OER as Learning Objects**
The learning object, which was compared to the LEGO brick by its proponents, was also criticized by Wiley et al. (2000) who proposed the atom as a better metaphor for the description of a learning object. The constraints and limitations of the LEGO metaphor is highlighted by Wiley et al. (2000) as Lego bricks are by definition “combinable with any other LEGO brick, assembled in any manner the assembler wants it, and that LEGO blocks are so fun and simple that any child can use it”. While Wiley et al. (2000) argue rationally why those definitions are not compatible with the learning object approach, the emphasis is laid on the inherent complexities of applying instructional methods to assemble learning objects into courses and that it is not as simple as it seems to combine learning objects together as compared to the LEGO bricks assembly.

**The Cost Implication: The Case of MIT OpenCourseWare (MIT OCW)**

In 2001, the MIT OCW (http://ocw.mit.edu) project (MIT OpenCourseWare) was first announced in the media and a wave of developments followed later on. In 2002, there were around 50 pilot courses released online. At that stage, it was a free publication of MIT course materials that reflects almost all the undergraduate and graduate subjects taught at MIT. In 2004, the creative commons license was applied to the publications. The latest statistics, according to Wikipedia is that about 1800 courses are available currently. It is however important to mention that the project has been jointly funded by the William and Flora Hewlett Foundation, the Andrew W. Mellon Foundation, and MIT. In other words, behind the production and free availability of open materials, there are significant investments to be made in any such initiative of the kind. As rightly highlighted on the OpenCourseWare project website, ‘free’ content has a cost, that of production of the material (from conception to writing) to the publishing of the material through the web in text, video and interactive formats. The estimated cost from MIT sources to support the OCW project is USD 4 million yearly.

**Communities of Practice: The VUSSC Initiative of the Commonwealth of Learning**

The Virtual University for the Small States of the Commonwealth (VUSSC) initiative is basically a network committed to the collaborative development of free and open content and resources for educational purposes. The VUSSC can be seen to be a small component of the WikiEducator project, which is of a much broader scope having the following terms of reference:

- Planning of education projects linked with the development of free content;
- Development of free content on WikiEducator for e-learning;
- Work on building open education resources (OERs) on how to create OERs.
- Networking on funding proposals developed as free content.

While the MIT OCW initiative can be seen as a top down approach, the VUSSC initiative mainly follows a community-based approach (bottom-up) focusing on a supposedly more sustainable but ambitious model of collaborative editing of free content. The strategy adopted by the Commonwealth of Learning is to have a maximum of WikiAmbassadors, “persons who believe in the value of WikiEducator, and promote WikiEducator as a platform for free educational resources, collaborative development and global network-building connected to their own institution, community, peers, or even within their own countries”.

Winters and Mor (2007) propose the participatory workshop model approach for the promotion of the OER within the
A first meeting that was called consisted of academics from the Faculty of Law and Management, the Faculty of Science and the Faculty of Humanities and from the Innovative Learning Technologies department. The representative of the Innovative Learning Technologies Unit is appointed as the team leader. The terms of reference for the team were:

- To come up with a module outline and structure.
- To develop an online module with self-instructional materials that can be taken up at any time convenient to a particular student.
- To use OER as far as possible in the courseware development process.
- To deliver the module fully online using the online learning platform and pedagogical tools available on the system.

Managing Differences and Division of Labor

The team consisted of 6 members and after thorough brainstorming sessions, the module was mounted in four distinct parts and team members were assigned chapters and units from each of the chapters based on their previous teaching experience and fields of activity.

At this stage, there was a need to cope with the differences of perspectives as different members viewed the same aspect of one component differently. For instance, the way the representative from Science will view the application of statistics or the design of an experiment a bit differently from the representative of the Faculty of Humanities.

The content of the course has therefore been divided into four parts:

- Part I: Research Process and Ethics
- Part II: Research Design
- Part III: Analysis and Interpretation of data
- Part IV: Writing up and presentation
Conflict management and resolution in such a context is done through the appointment of the Chair who is usually a person of higher authority that all the team members (Santally & Senteni 2004; Engestrom 1987) for dealing with conflicts and differences that cannot be resolved by the team. For the development of this module, it was agreed that the OERCOMMONS portal and the Open University UK OPENLEARN Portal be used as primary resources for free content. It is worth to be noted that at this stage all members of the team were not fully unanimous on the use of OER for the course.

**Courseware Authoring Process Lifecycle**

- **Step 1: Preparing the module specifications sheet**
  - The first element to be decided when using a courseware development method that focuses on OERs is whether to use a top-down or bottom-up approach to the process. The top-down approach is to start with the requirements of the stakeholders (course, students, university, the educational system), draft a module specification sheet and then work on the elaboration of the courseware.
  - On the other hand, the bottom up approach will require step 2 to be done before step 1. This means that the learning resources that are available are first researched, and then based on what is available, a module specification sheet is proposed. In the context of the present work, a top-down approach has been adopted.

- **Step 2: Searching for and classification of learning resources**
  - As established, the two primary sources identified to look for learning materials were the OERCOMMONS platforms and the OpenLearn environment of the Open University of UK.

  The first issue is that a simple search using the keyword “Research Method” on OERCOMMONS returns a hit value 218 with all the courses having the words in the title with different levels of contextualisation. It is a time consuming process to go through the courses to see whether they meet the criteria being looked for. In this respect, however, the metadata, if properly documented can help reduce the seek time. On the other hand, no such learning unit on Research Method were obtained on OpenLearn.

  The open learning resources that were selected are:
  - Basic Research Methods (Hit Number 1)
  - Qualitative Research: Design and Methods, Spring 2005 (Hit Number 2)
  - Crafting Research Questions and Qualitative Methodology, Fall 2005 (Hit number 8)
  - Methods of Discovery: A Guide to Research Writing (Hit Number 9)

  The first rationale for selection was to keep the most generic, de-contextualised ones and those seeming to be most relevant to the current requirements of the course being developed. It is also important to keep a limited selection as too many would tend to bring the course developer in a never-ending process of trying to select the most appropriate resources. Rather, the process can be done in an incrementally iterative approach to provide for continuous improvement.

- **Step 3: (Re)Contextualisation Process**
  - Depending on the nature of the subject matter, resources that are available can be often fully re-utilised ‘as is’ with minimal contextualisation. Even if
there is a need to repurpose to a higher extent, content experts and instructional designers can work together to create new learning activities, and learning examples that can be used as additional materials. Another issue here is sometimes the additional materials might be available from copyrighted sources that are not released under the open resources regime. It becomes therefore difficult to apprise how ‘fair-use’ concept can be coupled with OER, as ‘fair-use’ does not imply the right to put the material in public domain. One possibility that was avoided in the development of this course was to have recourse to highly contextualised material, as then there is a need to de-contextualise, and then to repurpose the material. This is a highly time consuming task. In the present case, the contextualisation process was mainly a mapping which was done to fit the resources that were selected on the module specifications sheet that was developed. Then missing parts were either developed from scratch, or used under fair-use policy from copyrighted materials (paraphrased and appropriately referenced in most cases).

- **Step 4: Value Addition**
  Content repurposing is different from value addition to the learning material. While content repurposing is mainly the process of making the same material suitable for a different audience, meeting local cultural constraints, or adapting some global theory in a local context, value-addition is mainly seen as process that tend to improve the overall quality of the learning material itself. This can relate (but is not limited) to the elaboration of novel pedagogical approaches, catering for different learning styles, and the use of multimedia to enhance the learning process. In the case of the current course, a PowerPoint presentation that summarises the concept of research methods, obtained from the first course “Basic Research Methods” was improved by the use of the instructional technique of text-to-speech integration (Rughooputh & Santally 2008) to provide a multimedia presentation to the students. This will simulate what the lecturer wants to say from the PowerPoint presentation based on his own expertise and experience as well as from the tutor notes that originally accompanied the course when it was downloaded.

- **Step 5: Courseware Publishing & Delivery**
  The final step is actually to publish the courseware either on an e-learning platform or contribute it to a public OER platform. In the current context, the course will be first disseminated through the in-house e-learning platform on a prototype basis. The overall cycle is of course, an iterative one as the course is subject to continuous improvement through peer review and also from learner feedbacks.

**Discussion**

From this prototype experiment, it is clear that open educational resources can be used in the teaching and learning process in a number of ways namely (1) as building blocks of new courses, (2) as supplementary and complementary materials to existing courses, and (3) as ready-made courses that are imported in the local e-learning platform. In the current project, the open resources were used to create a complete course (i.e. as
building blocks) and in this case there is a need for the application of a well structured instructional approach. This has also been proposed by Conole et al. (2007) who provided six arguments supporting the need of a learning design approach in such endeavors. It has been observed in this experiment, that depending on the availability of resources, level of existing contextualisation and the educational philosophy governing the conception of a course; it might be more complicated to go the OER approach than to create the course from scratch. A simple look at the OERCOMMONS platform show that those materials are available in a variety of formats, and in some cases learning metadata standards are not followed, which makes it difficult to reuse and remix. On the other hand, the OPENLEARN platform contains OER materials packaged in units of study which can be easily imported, restored and modified easily on any learning standard compliant e-learning platform. Another important observation is that whenever, there is a need to articulate open resources with proprietary materials, it is found that there are no clear guidelines or prescribed step to follow. While this can easily be done, the issue remains the release of the material in the public domain. The main question is on what license terms are these materials appropriate to be released. Even in the case where proprietary materials are not used, the different combinations that are available for the licensing of content under the creative commons can sometimes be tricky. The issue of non-commercial use was also a major issue for the authoring of this course. The University of Mauritius charges students to follow programme as either a short course, a stand-alone module or as a 3 to 6-credit module (where 1 credit is equivalent to 45 hours teaching) in a postgraduate course which is fee-paying per credit. While the content may carry a non-commercial vignette, the question that arises is that whether it is ethical, legal and moral for the university to charge minimum fees to meet the costs of the service being offered.
Conclusion

From this experiment of courseware development, it is obvious that issues related to the use of open educational resources are very much alike in different educational systems and contexts. From this bottom-up approach, an iterative life-cycle model for OER courseware development emerged but which obviously needs further refinements and derivations. The guiding quality assurance principle was to use an incremental development and delivery approach in an iterative cycle. The main concern for ‘open’ e-learning is no more about mindsets, ICT literacy levels or Internet inaccessibility but is increasingly related to more pragmatic and practical issues related to implementation - such as the ease of use, coherence and availability of the materials, inherent complexities of the learning design process, and the nitty-gritty aspects related to intellectual property and copyright. It suffices that someone raises a slightest of doubt about the legality of use of a product from open resources, that a whole project of the kind can be dropped.
References


Efficiently Managing Large Student Numbers with ICT

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Abstract

For classes with more than 2000 students enrolled, organization by itself is a challenge: splitting of those classes into several separate lectures, arrangement of the associated tutorials into small groups of students, allocation of adequate rooms, and scheduling examinations. Moreover, administration of homework and exams needs to be done, where depending on the field of study very different rules are to obey. This especially pertains to the Department of Mathematics because it offers most of the compulsory classes in mathematics for all fields of study, which are the biggest classes, held at the TU Berlin, to be attended by the majority of students. Thus, the Moses (Mobile Services for Students)-Account is being developed and used since 2004. This web-based software allows students to enrol in tutorials, with a list of preferences for given dates. A special algorithm, providing a globally optimized (with respect to the students’ wishes and the available resources) solution, processes all registrations.

Keywords: Academic timetabling, integer programming formulation, NP-completeness, post-enrollment, university administration, university timetabling

Introduction

In principle, timetabling problems appear at every school or university. The degree of difficulty increases, however, very strongly with an increasing number of students and courses for which the time scheduling shall be carried out. From the mathematical point of view this is a “hard” problem, since the runtime on a computer cannot be estimated by a simple law (i.e. by a polynomial law) in the number of parameters. These kind of problems are called NP hard, see (Garey and Johnson 1978) for details on NP hard problems and (Cooper and Kingston 1995) for the complexity of timetabling problems. There are three important versions of the timetabling problem at universities, known as the university timetabling problem.

Curriculum based Course Timetabling

In each semester lectures for several courses have to be scheduled within the given rooms without conflicts for students according to the curricula for each study plan. For each teacher time conflicts have to be taken into account, i.e. one teacher can only give one course at a time. There are further constraints given by
the required capacity of rooms for a course (based on estimated number of students in each course). There may be further constraints, e.g. by the requested room equipment. This is the most important university timetabling problem that has to be solved at any university.

**Post Enrollment based Course Timetabling**

For each course, e.g. big lectures with several hundreds of students, there may be additional small classes (tutorials). These tutorials are scheduled after enrollment of the students for the courses. Typically, each student has to be scheduled for several tutorials. Since the tutorials are small classes and each teacher (tutor) has to give several tutorials and there is only a limited number of small rooms there will be several parallel tutorials during the whole week. Thus, this timetabling problem cannot be solved together with the curriculum based course timetabling problem.

**Examination Timetabling**

In this setting the dates for the written examinations have to be determined such that students can attend all examinations as defined by their curriculum. As an additional boundary condition an adequate space of time shall lie between each examination each individual student has to attend. In contrast to the problem from section 1.1 room-equipment is generally not taken into account. In exchange generally more than one room has to be assigned for one examination in order to provide enough seats.

All specified problems are important for room management at universities, for the realization of courses that can be studied according to curricula, and for the satisfaction of students and teachers. These problems are related to the optimization of room management and personnel costs (e.g. by a uniform distribution of students). Thus, the solution of these problems is related to the optimization of “real” costs, a more and more important economic factor at (German) universities. Introduction of the two-tiered Bachelor and Master courses has raised awareness for these problems at German universities: due to the multitude of new courses the timetables, which have been established and stood the test of time, cannot be used any longer. Moreover classes tend to be more structured and school-like; attendance is compulsory and dependencies between modules are depending on the feasibility of the curricula. This feasibility is also evaluated while accrediting new study courses. Since 2003 for the solution of the post enrollment based course timetabling problem at the TU Berlin we are using an algorithm that has been realized in our team, see (Grottke et al. 2006 and Jeschke et al. 2007).

For the third problem, the examination timetabling problem (sec. 1.3), within our team an algorithm has been developed, that is currently implemented to solve the real data problem for a large set of courses, see (Lach 2008).

Timetabling problems are important administrative problems at universities. The most important types of this problem are the general university timetabling problem (timetable for lectures), the post-enrollment timetabling problem and the examination timetabling problem (timetable for final examinations). The post-enrollment timetabling problem occurs for big lectures (typically with several hundreds of students) where several small exercise/recitation classes are offered. These so-called tutorials are offered for different time slots and the students have to be distributed into these tutorials taking into account their individual constraints, e.g. students are enrolled into different lectures with accompanying tutorials. That is, many students with individual time constraints have to be matched to one or more tutorials on different
time slots. Since the individual constraints are not known a priori, letting the students make ratings (often called “wishes” here) and finding a matching in that manner that as much as possible students are mapped on their highest ratings seems to be an appropriate procedure.

Related Works

Timetabling problems that have to be solved for specific schools or universities differ in their details because of cultural and organizational differences; e.g. courses consisting of large (parallel) lectures with very many corresponding small tutorials to which all the students have to be allotted to, do not occur at German universities of applied sciences, because students are instructed in small courses there. In such a setting it is much easier to solve the corresponding problems than at a large university like TU Berlin. Thus, it is not astonishing that a lot of German universities of applied sciences can use commercial software-solutions that do not find an – in a mathematical sense, while considering the students’ wishes - optimal solution. When evaluating existing commercial solutions we were not able to find a product that could convince us about its capabilities in tackling our problem. Timetabling problems appear in every branch of economic activity and commercial solutions exist for some standard problems, yet the diversity of the timetabling problems and their differences in detail result in a lack of a commercial software solution that can be introduced for academic purposes. ILOG the market leader in the optimisation-software market is selling CPLEX (ILOG 2008), the solver we use to find our optimal solution. However, CPLEX is a universal optimisation tool and the practical challenge lies in modeling the problem in a way that it can be solved with CPLEX subsequently. The exact formulation of a timetabling problem depends on the university specific requirements of the generated timetable. Typically the constraints of a timetable can be classified in two groups, soft and hard constraints. The hard ones can be considered as the conditions, whose adherences guarantee a feasible timetable. The soft constraints are those constraints whose violation is tolerated but penalized. Hence these constraints are interpreted as not to have a fundamental relevance for the university activities.

We are able to solve large instances of the three mentioned timetabling problems (larger than all instances that have been reported in the literature). In the context of PATAT08, a conference, which focus is exclusively restricted to different timetabling problems, a precise description of the different timetabling problems has been defined in 2006, see (DiGaspero et al. 2007). In the literature various solution methods of various specific problem types are known, most of them heuristic methods, see (Burke et al. 1997, Lewis 2007 and Meyers and Orlin 2007). Furthermore methods based on integer programming (Daskalaki and Birbas 2005, Qualizza and Serafini 2005, Schimmelpfeng and Helber 2007 and Ribeiro Filho and Lorena 2006) exist. Some methods of both types are already in practical use and applied to generate timetable for small universities or part of universities (Broek et al. 2006). However all of them are not able to solve real-world instances based on the data of large universities.

Organization of Classes at TU Berlin

One of the major challenges facing universities is the organization of the study supporting processes, especially in freshmen courses (Jeschke et al. 2007). With student numbers of about 30.000 (cf. Fig. 1), TU Berlin is one of the largest universities of technology in Germany. As a service for other faculties, the institute of mathematics is in charge of the mathematical education of most
students, independent of their actual course of studies, making it the biggest “service provider” of the university. Students from more than 20 different programs attend one or more courses of the nine mathematics for engineering modules:
- Calculus I-III,
- Ordinary Differential Equations,
- Integral Transformations and Partial Differential Equations,
- Linear Algebra,
- Numerical Mathematics,
- Mathematics for Economics I & II.

The freshmen course Calculus is the largest module with a total count of more than 2,200 students per semester.

![Student Numbers at TU Berlin from winter term 98/99 until winter term 05/06](image)

In order to guarantee lecture class sizes of less than 250 attendees the modules are organized as follows: multiple lectures are held in parallel and the lecturers of the individual lecture classes take care of presenting the same mathematical material to all attendees. In addition to lecture classes, all students have to solve the same exercises as homework to be admitted to the written examination at the end of the semester - in case of a sufficiently high homework score. Students also are eligible to attend small-sized exercise/recitation classes (tutorials) consisting of 15 up to 30 students.

The administrational duties for performing mathematics service are summarized in the following list:

1. Assign all math-service students to exercise classes
2. Manage homework scores for admission to final examinations and course credits
3. Management of student registration for examinations
4. Inform students about examination scores
5. Collect and submit examination scores to the central office of examination.

Although all of the above tasks are typical administrational duties for student management at universities, the large course sizes make them very time-consuming and labor-intensive. This is especially true for the assignment into exercise groups for every module: All students have to be assigned to small groups such that assignments do neither conflict with each other nor conflict with the individual schedules of the students while respecting certain capacity restrictions. However, the large course sizes not only present difficulties; they imply a great opportunity of rationalization in the student-administration. Against this background the development of MosesKonto (Grottke et al. 2006, cf. Figs. 2,5-6 for sample screenshots) began in 2002 and was initially deployed and used since 2003 for all courses within the math-service modules described above. Since the winter term 2005/6, the assignment into exercise classes and management of exams has been extended to cover further courses, even across different schools. In the winter term 2007/08, 6 out of 7 schools at TU Berlin used the MosesKonto for the post-enrollment into their tutorials, i.e. approximately 50% of all students are distributed into their tutorials by this system. In winter term 2008/2009 15,142 tutorial places were distributed to 5,498 students (thereof 1,928 freshmen). In 2008 we allocated a total of 29,138 places. Please see appendix 1 for the complete results for the winter term.

**Tutorial Assignment**

Every student attending a course with additional tutorials is eligible to attend an exercise class. The number of attendees for a particular course is not known until the semester starts, as the enrollment process does not end until then. The students cannot know their complete schedule until this time either, and the variety (with respect to course of study) of students attending different courses implies a great variety in individual schedules. These two details make it impossible to fix a set of dates for exercise classes in advance. Instead, one is forced to find dates for these tutorials in the first week of a new semester, by taking into account all students’ timetables.

Until winter term 2002/3, the assignment of students into exercise classes was performed independently for every math-service module (and for each of the other modules). This procedure required all students of a particular module (up to 1,000 at that time) to gather in the main lecture hall in order to receive their exercise class dates. Students were numbered and subsequently drawn by lot to choose their most preferred date from the remaining dates in the global pool of exercise classes. Of course, this procedure could not guarantee every student receiving his most preferred date, but it did ensure that the assignment of a whole course is feasible within 90 min.

Integration of additional courses (thus, increasing the number of students to be administrated by math-service) invalidated the above assumption about the feasibility of the assignment method. In fact, the last time the above method was applied; it took several hours and forced more than 2,000 students to be physically present in a completely overcrowded main lecture hall construed for 1,200 students (cf. Fig. 3).
Since this development in the number of attendees was foreseeable, the development of a web-based registration procedure (cf. Fig. 1) began in the spring of 2002; the new method has been used since the summer term of 2003. The major goals of the new procedure were:

1. Gather early information on the expected number of students for every module
2. Take into account the student’s individual schedules by collecting their “wishes” for dates
3. Distribute students as even as possible among all exercise classes of every module

4. Assign students such that no date conflict arises for students that attend tutorials in more than one course.

For various reasons it was not possible to access the personal data of the students from the central enrollment office. Thus, to realize a procedure that respects the above requirements, students would need to register at MosesKonto and create a personal account. But, as a side effect, the same personal data can be used to manage the final exams. The latter is a great improvement over the established way of registering for an exam: students had to register at the central office of examination with a paper form, from which a press copy of their registration form is sent to
the department of mathematics, where these copies are entered in an excel sheet. Of course, numerous transcription errors are produced that way.

All of the above requirements could be easily met by means of an assignment procedure operating on a first-come-first-served basis. However, it would favor those students over others, who receive their certificate of enrollment earlier. Moreover, from a technical point of view, it would concentrate the registration traffic on a very short time span, which means that the system probably would not scale well for increasing numbers of students. This motivated our decision for a global optimization method: Over a given time span, say, two weeks, students have the opportunity to register for the tutorials. When we started in 2002 the system had only been used for the math-service tutorials. The students could choose personal priorities from a range of possible dates for every math-service module. Since the system is used for many other lectures with tutorials, the students can globally choose priorities for different time slots. All students will choose their favorite dates using their MosesKonto account and they can revise their choices at any time. After the registration time span, the collected data is used to compute an assignment that is optimal in respect to all students’ priorized wishes.

Often, students have organized themselves into groups of two or three to work collaboratively on their homework, for example. It is desirable, although not essential, to let all group members attend the same exercise class. MosesKonto offers the opportunity to register for tutorials as a group (different students can form different groups for tutorials of different lectures), which implies that all group members automatically choose the same priorities for the available tutorial dates. The functionality to manage groups (change groups, step back, etc.) is provided through MosesKonto as well. These groups are not formulated as constraints in the global optimization problem, but some care is
taken to respect these wishes for groups if possible.

Global Optimization

The optimization step involves the computation of all assignments of students into tutorials, such that room- and teaching-staff capacities are respected and the computed solution is optimal in respect to the chosen priorities of dates. The problem admits a formulation as a constrained minimum-cost-flow network problem; see (Ahuja et al. 1993, Corman et al. 2001, Löbel 2000, Nguyen & Tan 2003 and Salehi Fathabadi & Shridel 2003). An example of this network is depicted in Fig. 4.

To describe this in terms of a network flow problem let \( s_i \in S \) be a student. Nodes \( t_j \in TS \), representing distinct timeslots are linked to the student and each link of each such node to another \( t_j \in TC \) represents a rating. Each \( t_j \in TC \) represents a tutorial then, and \( cap(t_j, c_l) \) defines the capacity of this tutorial as the upper bound of the arc linking the tutorial with the sink. The total demand for tutorials is defined as the flow at the source \( s \). To safeguard that every student is assigned exactly one place in a tutorial for each course, some bundle cuts \( w \) are defined, forcing this property. The resulting integer linear program finds a solution in acceptable time, that is, less than one minute for the largest instances seen so far on a recent machine. The data from MosesKonto is accessed and preprocessed by the software TUTOP (Luce 2003), which also formulates the integer program that is then to be solved by the commercial software CPLEX (ILOG 2008).

Administration of Examinations

In most courses using the MosesKonto to distribute their students into the tutorials, each student has to pass a written final examination (consisting of up to three separate written
tests) for each module. As a result, up to 2,500 written exams have to be handled in each course, creating a substantial administrative overhead. The efficient organization of such large exams requires punctual registration on the part of the participating students. The results have to be published and forwarded to the central office of examinations. Finally, the results have to be processed statistically to provide the responsible deans with information concerning the success of the courses.

To satisfy the regulations imposed by the different courses of studies it is necessary to hold up to three different (though identical in content) exams. As a result, the students feel insecure for which exam they have to register. To alleviate this problem, the students are only presented with the appropriate exam for their particular course of studies when registering for the final exam for a given module. Registration for final exams for compulsory optional subjects and exams governed by older or more “exotic” examination regulations has to be done in person at the service center, which also has access to the examination administration of the system. When “creating” an exam in the database, the registration and deregistration periods have to be specified (cf. Fig. 5). Students have to (de-)register during that specified period only, deregistering for (officially certified) medical reasons being the only exception being handled exclusively by the central office of examinations. Information for each exam is available for download by the service center or other

![Fig-5: MosesKonto administrator-interface displaying overview of students registered for examinations](image-url)
authorized staff in the form of a zip-file containing the following:

1. A list of all students registered for this exam, including their personal data and the results of the exam (in csv-format)
2. Separate lists for each course of studies, containing the names and personal data of each student registered for the exam to be forwarded to the central office of examinations (LATEX -Format)
3. A complete list of all registered students including personal data for proof of identity during the exam (LATEX -Format)
4. Separate lists for each course of studies, containing the names, personal data and exam score of each student registered for the exam; these lists can be directly imported into the database of the central examination office (Excel-format)
5. A complete statistic including a graphical representation of the results (LATEX -Format)

Administration of Homework

Most courses require mandatory homework as a prerequisite for admission to the exams for most courses of studies. The homework-related criteria that are to be met for admission to the exams are currently dependent on both the module and the professor teaching it. In consequence, it is necessary to store the criteria (as a boolean) for each module and each semester separately. Authorized staff can access the list of course participants at the end of the semester to add if the student met the homework-related criteria or not.

The system does not check if the homework-related criteria are met during the online registration for the exam as the last homework assignments are regularly neither handed in nor graded by the time the registration period has expired. Staff members can afterwards easily get a list of the students who registered for the final examinations, but do not fulfill the homework criteria (depending on their course of studies).

Access Rights Management

When we started the MosesKonto in 2003, for lack of a central authorization system we created our own user management. Since winter term 2007/08 we are using the central LDAP server of the IT service center of the TU Berlin (tubIT) realizing a “single-sign-in” solution. Now, students get access to their university mail account, WLAN on campus, and the MosesKonto with the same id and password. In the near future, the MosesKonto will be integrated into the TU web portal to realize as real single-sign-in (with several other services offered by tubIT). Additionally, users have to be equipped with different detailed rights, depending on their role. Typically, the users of a system fall into one of the following groups requiring fundamentally differing access right that can even vary between departments:
1. Students, as a rule, are granted access to their own personal data and nothing else (exception: courses allowing teamwork). They are given write-access for their own data and for registering for exams or exercise classes, otherwise read-access only.
2. The Administrator is given access to all information; he is provided with additional, special rights, such as the creation of new modules.
3. Employees of the Service Center are usually responsible for all communication with the central office of examinations and is the central contact for all students.
4. Teaching Assistants are often responsible for entering the results of exams and similar tasks.
5. Tutors will input if the homework-related criteria are met and have access to the personal data of their students.

The growing interest of other schools to use the MosesKonto for the registration for their own exercise classes, examination and student administration outside the mathematical service modules required an expansion of the access right management to facilitate the...
independent administration of their students. These changes have to account for different access right requirements for the above mentioned user groups. As a solution, we have implemented a hierarchical access rights management system mirroring that of UNIX. All reading or writing rights for the different types of information (e.g. access to the students’ personal data or to their examination results) are treated as a single, independent resource. Passing these resources (reading or writing) is treated as a third type of resource. User groups (e.g. teaching assistants) can be created and are defined by their associated access rights. The owner of a group (either because he created it or it was associated with him by default) has the right to add or remove members of the group or grant access rights to group members within the limits of his own rights. Students are outside this access rights management, as their rights do not have to be defined on a per-module basis. The right to register for an exam for example can be managed through the use of a registration time period.

Experiences with the System

The MosesKonto has been deployed successfully at the TU Berlin for nearly five years. The registration for exercise classes for the mathematical service modules would be impossible without the online registration given the steadily increasing numbers of participating students each semester. The online registration spares both the students and the teachers from time-consuming in-situ registration while better addressing the needs of students. The approach of a global optimization implemented in the system requires a significant amount of effort in the mathematical modeling of the problem but provides the following, significant advantages:

1. Conflict-free assignment of tutorials across several, different modules
2. Optimal adaptation to the wishes of the students
3. Optimal use of existing room resources
4. Optimal use of existing staff resources
5. Instantaneous information concerning number of participating students

The deployment of the MosesKonto to administrate exams has been equally successful. Without the use of online registration, it would have been impossible to keep up with the vastly increasing number of examinations that has also been caused by the new Bachelor/Master system at German universities. The online registration has saved students hours of waiting commonly associated with the registration for an exam. Starting with the winter semester 2005/6 the use of the MosesKonto has been extended to cover modules beyond mathematical service courses. In consequence, the MosesKonto will administer the tutorials for the most courses of all students in their first and second year. The conflict-free assignment of exercise courses for these courses represents a significant improvement in the course administration.

Cost/Performance

A single user license of the optimization software used by us, CPLEX, for commercial purposes is approximately € 15.000 with additional annual maintenance costs of 18%. For a period of 10 years this totals in costs of € 42.000 or € 4.200 per annum. In the year 2008 the system allocated more than 29.000 tutorial places. Thus, the cost per tutorial place allocated is less than € 0.15. The personnel expenditures for doing the distribution by hand are difficult to estimate, yet we try to give a comparison: the cost per year roughly equal a scientific staff’s monthly wage. For simplicity reasons we assume that this scientific staff works one whole month (we should actually consider two times two
weeks, as the distribution has to be done twice a year) on the tutorial distribution, then in order to finish the job on time for the allocation of every single tutorial place less than 22.5 seconds are available, whereas the system needs less than one minute to provide an optimized solution for all places. This simple thought experiment shows that in terms of cost and velocity our system clearly outperforms a manual distribution. Moreover, every teaching staff who is confronted with schedule difficulties from students and colleagues knows that manual solutions, in the majority of cases, are far from optimal. The development costs of our system would have to be added to the above cost, however they could be neutralised as this work was done as a regular research activity.

Since CPLEX universally is usable therefore can be used for all three distribution problems (tutorial-, room- and exam distribution) mentioned above, the costs go down correspondingly. An exact estimate is difficult because the previous costs are based on personnel expenditures and are not on hand. Furthermore, “costs” like administrative-staff, teaching-staff and student satisfaction cannot be estimated.

At least at TU Berlin all participants involved are extremely satisfied; especially the teaching colleagues who are exempt from these organisational burdens at the beginning of each semester.

Another advantage arises from our modus operandi: the assignment of student assistants can be planned within whole departments, e.g. mathematics or mechanics beyond specific lectures; i.e. assistants can be allocated to the specific courses “on demand”, depending on how many students have registered for a particular course. Moreover, human resources are not only optimally employed; personnel costs are saved by avoiding offering tutorials for sparse auditoria.

Table-1: Registrations for written examinations in the system 2005-2008

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Résumé and Perspective

One desirable future feature of the system would be a direct, automatic exchange of data, in particular, with the room management system of the TU Berlin. This exchange could be realized by using web services. Preliminary efforts of coordination have shown the general willingness of the central facility management to participate. However, certain adaptations to their software are required and are not yet implemented.

For efficiency-reasons and student-contentedness, of course in the medium-term it is planned to manage all examinations and optimize all tutorials at TU Berlin using the MosesKonto within two years. Anyhow, up to now MosesKonto is a service, offered by the Center for Multimedia in Education and Research (MuLF) and every department is invited to take part on a voluntary basis.

We have shown that the timetabling problem of post-enrollment can successfully be solved with mathematical techniques of discrete optimization, see (Schrijver 2003) as a general reference. For the future our group at MuLF is developing a solution for the university timetabling problem (for all lectures at the TU Berlin) and for the examination timetabling problem. The final aim is a system for the solution of these most important administrative problems at universities.
References


ASEE Global Colloquium on Engineering Education. American Society of Engineering Education.


Schrijver, A 2003, Combinatorial Optimization, Polyhedra and Efficiency, Volume A., Springer Verlag, Berlin, Germany
## Appendix:

### Winter-Semester 2008/09 Tutorial Allocation Data

Table-2: Statistical data from the winter-term 2008/09 tutorial allocation

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Building e-Learning Arab Content ePedia-Sy Approach

Ammar Kheirbek  
Salman Salloum  
Damascus University, Syria

Abstract

In this paper we will present the ePedia-Sy experience in building Arabic Content for Pre-University different levels. This experience is based on a comprehensive approach to eLearning. The main pillars in this approach are: Educational Standards that describe Pedagogical strategies such as required skills and knowledge – The concept of Reusable Learning Objects (RLOs) brought to its limits – A comprehensive Instructional Design methodology that defines systematic steps for building modular eLearning content, and takes into consideration the essential intervention of different specialists in different domains, and the role of Quality Assurance activities – A Delivery methodology of the eLearning Content via a standard Learning Management Systems (LMS) that defines Content Structure, Content Metadata (LOM Standards), Sequencing of RLOs, and Learning Paths. Our approach has been implemented and tested on developing more than 800 RLOs in different fields of Pre-University curricula such as: Algebra, Geometry, Chemistry, Physics, and Biology and for different levels from 5th grade to 9th grade.

Keywords: eLearning – Instructional Design – Educational Standards – Reusable Learning Object – Learning Management System – SCORM

Introduction

e-Learning aims to transform the learning process from teaching into learning or self-learning, and to present such a process through technological facilities that help to improve the learning experience in general, and to make learning more exciting and challenging for most people in most contexts. However, installing a high quality eLearning environment requires among other requirements a high quality learning content in a digital form. This content must encapsulate not only the teacher’s experience, but also the best pedagogical methodologies. For this purpose, a controlled process is vital to build such a content to reach the intended learning outcomes. The Instructional Design can be considered as a controlled process to build the target eLearning content.

Instructional Design

Instructional Design is the practice that is normally applied to build learner-centric rather than teacher-centric instructional materials. We can view Instructional Design from different angles, but all these views revolve around reflecting the underlying philosophy of teaching and learning. For example, how are teaching and learning joined together? What are the main factors that affect the learning experience? What is the role of memory? How information is transferred to learners? What are the best learning methodologies? …etc

In general, we can assume that Instructional Design must be applied in order to accomplish pre-determined learning
objectives to a specified group of learners in a given context. Instructional Design is “the process by which instruction is improved through the analysis of learning needs and systematic development of learning materials” (Innovative Learning). “Instructional Design concepts influence learning creation through Instructional Design models, each of which represents a view on how human learn. These models are the guidelines by which instructional designers create instruction” (Mowat 2007).

The most important issue, for many instructional designers while applying any model of Instruction Design, is that they expect from the applied model to be a representation for real actions and to be adaptable for each case. In other words, a given model could be suitable for a specific type of learning materials, whereas other materials could require different models. There are many Instructional Design models but most of them are based on the ADDIE model which consists of several consecutive phases: Analysis, Design, Development, Implementation, and Evaluation (McGriff 2000). However, technology-supported learning requires more advanced Instructional Design especially in the case where the content digitization must be performed within the applied Instructional Design process and must be managed in order to reach a high quality digital content, not only from technical perspective, but also from pedagogical, linguistic, and scientific perspectives. Moreover, traditional Instructional Design models may not always meet the needs of modern eLearning content approaches and more specifically the Learning Object approach.

Reusable Learning Objects

“The Learning Object concept has many different definitions; each of them is related to its scope” (Khierbek, Salloum & Tannous 2008). IEEE LOM (2002) defines a learning object as “any entity, digital or non-digital, which can be used, re-used or referenced during technology supported learning”. This definition characterizes a very wide range of learning process resources, because it includes almost everything that can be involved in learning processes, even some of these resources are not digital such as a teacher or a book. Some other definitions refer to different aspects of the learning object, such as self containment, digital property, descriptive metadata, or even pre-defined duration. However, the main characteristic of learning objects, that all these works revolve around and can be concluded from, is the reusability of learning objects. A Reusable Learning Object (RLO) has the ability of being reused in different learning contexts and for various objectives. RLO’s descriptive data, or RLO’s metadata, must be encapsulated with the RLO itself to enable easy and efficient reusability. Although, metadata must describe different properties such as: educational, technical, and relational properties, previous works focused only on defining the technical specifications and the technology-based standards for learning objects.

eLearning Standards and Specifications

There are many organizations that are involved in developing standards and specifications for eLearning. eLearning standards and specifications are technical protocols that enable flexible exchange of content and data between different systems. In general, these standards and specifications aim to make feasible the abilities of eLearning such as: Interoperability, Reusability, Accessibility, Durability and Manageability. By consequence, these standards and specifications are very important for: metadata, content aggregation, content sequencing and navigation, content delivery, learner tracking and assessment. IEEE has defined a standard for Learning Object
Metadata (LOM) (IEEE LOM 2002) that provides a structured description for RLOs with metadata elements grouped into nine description categories: General, Life cycle, Meta-Metadata, Technical, Educational, Rights, Relation, Annotation, and Classification. Moreover, Advanced Distributed Learning (ADL) organization has developed SCORM (Sharable Content Reference Model). SCORM “is a model that references and integrates a set of interrelated technical standards, specifications and guidelines designed to meet high-level requirements for learning content and systems. SCORM describes a “Content Aggregation Model” and a “Run-Time Environment” for instructional objects to support adaptive instruction based on a learner’s goals, preferences, prior performance and other factors. SCORM also describes a “Sequencing and Navigation” model for the dynamic presentation of content based on learner needs” (Advance Distributed Learning 2006). “SCORM content can be delivered to learners via a SCORM compliant Learning Management System (LMS) using the same version of SCORM” (Advance Distributed Learning 2008).

Reusable Learning Object Instructional Design

We believe that the technology itself is not sufficient to obtain the potential benefits of RLOs without a change or an adaptation in methodologies generally used by instructional designers. For this reason, we think that building RLO-based learning content deserves an RLO-based Instructional Design process that incorporates the concept of RLOs in each step. Thus, the RLO concept must be conserved, not only on the technical level, but also on the authoring level in order to make operational the notion of reusability. Technical reusability could be validated through eLearning standards, such as SCORM, whereas non-technical reusability needs awareness from the author while authoring the content. One of the recent relevant experiences, that has been discussed this issue, is the Learning Objects Instructional Design Model (The Herridge Group 2005, Mowat 2007). This model defines ten phases that incorporate and build on the generic phases that can be found in most models, and concentrate on the concept of Learning Object in each phase. In general, there are two main outcomes that must be issued from the RLO-based Instructional Design: the intended content itself and the RLOs of this content. The intended content is normally defined through predefined learning objectives which are sometimes referenced as educational standards.

Educational Standards

For any learning content, there are predefined objectives must be reached. These objectives are generally known as Educational Standards. They define pedagogical strategies such as required skills and knowledge that students should have at critical stages in their educational sessions. "Standards serve as a basis of educational reform across the nation as educators and policy makers respond to the call for a clear definition of desired outcomes of schooling and a way to measure student success in terms of these outcomes” (National Research Council 2001). For this purpose, any applied Instructional Design process must take into consideration those standards, if exist, in order to reach the intended outcomes in the intended context. If there are no standards for the content, the learning objectives are normally defined during the analysis phase of the instructional design process and organized around the principles of the outcomes-based education.

Arabic eLearning Content

The Arabic language is the mother tongue of millions of the people in 22 Arab countries. “The majority of Arabs, particularly in Saudi
Arabia, Egypt, United Arab Emirates, Kuwait, Bahrain, Qatar, Oman, and Syria use Arabic as the first language in their educational system” (Al-Khalifa & Davis 2005). This makes Arabic eLearning content very important for Arabs in order to get benefits of eLearning potential to improve their educational curricula. In contrary, the amount of Arabic eLearning content is not sufficient to enable the intended improvement. However, Arab countries have some key positive factors that enable them to make the intended reform in their education sector. One of these factors is the educational standards that had been developed for school curricula in some Arab countries. For example, the national Educational Standards in Syria had been published by the Syrian Ministry of Education in 2006. These educational standards are very helpful to apply the learning object approach on Arabic content, although there are minor differences in curricula between these countries.

Taking into consideration this rich background we’ve developed our approach to eLearning. The main pillars in this approach are: Educational Standards, the concept of Reusable Learning Objects (RLOs), a comprehensive RLO-based Instructional Design methodology and a Delivery methodology of the eLearning Content via a standard Learning Management Systems (LMS).

**ePedia-Sy Instructional Design Methodology**

ePedia-Sy Instructional Design defines systematic steps for building modular eLearning content, and takes into consideration the essential intervention of different specialists in different domains, and the role of Quality Assurance activities. Main phases in this methodology are the same as those in the ADDIE Model: Analysis, Design, Development, Implementation and Evaluation. However, each phase must be developed in depth in order to define an adaptable and a comprehensive methodology that enables the development of any type of content based on the RLO concept, the eLearning standards and the intended content criteria or the educational standards related to this content. The following paragraphs present key points about each phase:

![Fig 2 - The Analysis Phase](image)

**Analysis**

The main objective of the analysis phase is to define the intended learning content, the learning context and the different types of learners (Figure-1). The learning content is generally determined by its learning objectives and/or by its main subjects that can be obtained from educational standards or content criteria related to this content. The learning context is dependent on the learning environment in which the intended content will be delivered and assessed. The learners of this intended content are determined by different characteristics, such as age, degree of difficulty and any other special characteristics that must be considered. These are key issues, not only for next phases, but also for determining the required specialists and their competencies. The collected information will help the project manager to determine the time needed for the remaining steps of development and to estimate the cost.

---

(250)
The output of this phase is the Content Statement Document that outlines all these issues, as illustrated in Table-1.

<table>
<thead>
<tr>
<th>Content Statement Document Form</th>
<th>Intended Learning Content</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Title</strong></td>
<td>Chemistry</td>
</tr>
<tr>
<td><strong>Learning Context</strong></td>
<td>Basic Education – Grade 9</td>
</tr>
<tr>
<td><strong>Language</strong></td>
<td>Arabic</td>
</tr>
<tr>
<td><strong>Educational Standards</strong></td>
<td>National Educational Standards – Ministry of Education - Syria</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Content Syllabus</th>
</tr>
</thead>
<tbody>
<tr>
<td>تفاعلات المادة</td>
</tr>
<tr>
<td>أنواع التفاعلات الكيميائية</td>
</tr>
<tr>
<td>محاليل الحموض</td>
</tr>
<tr>
<td>محاليل الأحماض</td>
</tr>
<tr>
<td>الكيمياء الغذائية</td>
</tr>
<tr>
<td>الكيمياء النووية</td>
</tr>
<tr>
<td>التكنولوجيا والموارد</td>
</tr>
<tr>
<td>الطاقة والتكنولوجيا</td>
</tr>
<tr>
<td>التكنولوجيا الكيميائية</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Intended Learner</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
</tr>
<tr>
<td><strong>Language</strong></td>
</tr>
</tbody>
</table>

**Design**

The design phase is the most crucial one because it contains the planning of the instructional strategy, the description and the authoring of the content, and then the review and validation of the content (Figure-2)

- **Instructional Strategy Planning**
  At this stage the following main issues must be discussed and defined:
Learning Content Component Model
A flexible learning content component model defines different levels of learning components, the properties of these components, such as granularity, and how the components can be aggregated into more larger learning units. This model is very important due to the different opinions regarding the size or the granularity level of an optimal RLO. The model, explained here, is a general one that could be customized for each case. This model consists of three main components: assets, learning objects and learning units. Basically, assets must be related to the individual media resources; learning objects represent the modular basic building blocks (RLOs); learning units are aggregations of learning objects in order to form more larger learning units on the granularity scale, such as subjects, lessons, modules, chapters, courses, etc.

This is a general model that must be customized for each case in order to define what the learning object is and what levels of learning units are needed for the intended content. This customization must be decided according to the content criteria or the educational standards. While doing aggregations on learning objects to obtain learning units we must be aware to conserve their self-contained property and to have a similar level of granularity.

Moreover, the learning object types could be discussed here more deeply. In our approach, we define four types of learning objects:

- Idea: is dedicated for a concept’s explanation;
- Exercise: is dedicated to help learners to understand the explained concepts;
- Pre-Assessment: is dedicated to give the learner some hints about the key concepts that will be learned;
- Post-Assessment: is dedicated to measure the learner understanding.

Assessment and Exercise Strategy
At this stage the overall strategy for assessment and practicing the content through exercises must be determined because it affects the structure of the content and the delivery methodology (cf. next paragraphs).

Description and Authoring Strategy
Once the content component levels are determined, different forms must be designed to allow describing these components and to write its content as well. On the other hand, and because we need to build standard content, we must consider the eLearning standards at this stage, especially those related to
metadata, and decide what are the required information about the content that must be provided by the Subject Matter Experts (SMEs). For this purpose, ePedia-Sy develops dedicated forms for content description and authoring, which enable SMEs not only to write content, but also to provide metadata about this content. Examples of these metadata elements are: Title, Description, Keywords, Typical Age Range, Typical Learning Time, Prerequisite Knowledge and Skills, Expected Knowledge and Skills, and others. Each learning component has its dedicated form. For example, Learning Object Description Form, Learning Unit Description Form. Assets are normally described or referenced inside the Learning Object Description Form. In this regard, any needed guidelines for SMEs must be prepared.

- **Review and Validation Strategy**
  A comprehensive review and validation strategy must be defined and agreed upon. This strategy must help to guarantee the total correctness of the content form all the different perspectives; such as the learning object perspective, the scientific perspective, the linguistic perspective, and the pedagogical perspective.

- **Learning Object Storyboard Strategy**

This strategy must address two main issues. First, how the learning objects presentation scenario will be described? Second, what is the design of the learning object user interface? Upon the answers of these questions, a Storyboard Form must be prepared, and an Interface Design must be designed and agreed upon.

- **Delivery Strategy**
  The Learning Content Component Model defines the organization of the content, which affects the authoring and description strategy. This organization will be also used to define how the content will be presented for learners through a standard LMS. As a result, a delivery strategy should be determined to address different issues such as: what is the pedagogical-instructional strategy that should be applied on the content considering the content nature, the learner, and the context? How content will be sequenced to reflect such a strategy? What is the intended delivery unit from the defined units in the Learning Content Component Model? How the standard (SCORM) will be applied to reflect the intended strategy?

However, someone may argue that these issues could be discussed later, just before the content aggregation. From our experience, it’s recommended to decide everything at this stage before the content authoring and description.
Content Authoring and Description
At this stage, the content component model is clear, not only for the Instructional Designer, but also for the SME. They begin to describe the content starting from the top level learning unit down to the learning objects of the bottom level learning unit. In addition, all required assets are described or provided for each learning object. This work must be done by filling the prepared forms. Consequently, a Learning Unit Description Form must be filled in for each learning unit; and also a Learning Object Description Form must be filled in for each learning object. It is important to notice here that some learning objects may are available (after searching in the RLO repository), so in this case there is no need for authoring them again, or they may require some modifications to make them valid in the intended learning context. Table-2 shows an example of a Learning Object Description Form.

Table 4 - Example of a Learning Object Description Form

<table>
<thead>
<tr>
<th>Learning Object Description Form - Idea</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General Description</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>This column for writing in English</strong></td>
</tr>
<tr>
<td><strong>This column for writing in Arabic</strong></td>
</tr>
<tr>
<td>Title</td>
</tr>
<tr>
<td>Features of Salt and Salt Solutions</td>
</tr>
<tr>
<td>خصائص الأملاح والمحاليل الملحية</td>
</tr>
<tr>
<td>Description</td>
</tr>
<tr>
<td>This learning object explains key features of salt and salt solutions through presenting some examples and experiments.</td>
</tr>
<tr>
<td>يشرح هذا الغرض أهم خصائص الأملاح والمحاليل الملحية وذلك من خلال عرض بعض الأمثلة والتجارب.</td>
</tr>
<tr>
<td>Keywords</td>
</tr>
<tr>
<td>Salt, Salt Solution, Ion, Sodium Chlorine</td>
</tr>
<tr>
<td>ملح، محلول ملحي، شاردة، كلور الصوديوم</td>
</tr>
<tr>
<td><strong>Educational Description</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Intended End User Role</strong></td>
</tr>
<tr>
<td>Learner</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Learning Context</strong></td>
</tr>
<tr>
<td>School (Basic Education)</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Typical Age Range</strong></td>
</tr>
<tr>
<td>14-16</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Difficulty</strong></td>
</tr>
<tr>
<td>Medium</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Typical Learning Time</strong></td>
</tr>
<tr>
<td>15 Minutes</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Prerequisites</strong></td>
</tr>
<tr>
<td>(Prerequisite Knowledge and Skills)</td>
</tr>
<tr>
<td>المعادلة الكيميائية وموازنتها</td>
</tr>
<tr>
<td>المحاليل الحمضية</td>
</tr>
<tr>
<td>المحاليل الأساسية</td>
</tr>
<tr>
<td><strong>Learning Objectives</strong></td>
</tr>
<tr>
<td>(Expected Knowledge and Skills)</td>
</tr>
<tr>
<td>بعد إتباع هذه الفقرة يتعلم المتعلم بأهم خصائص المحاليل الملحية، حيث يتعلم ما هو المقصود بالطبيعة البلورية للأملاح وبعض أمثلة على ذلك، كما يستطيع إجراء تجربة تبين قابلية الأملاح للانحلال في الماء وإجراء تجربة تبين النافلية الكهربائية للأملاح.</td>
</tr>
<tr>
<td><strong>Text</strong></td>
</tr>
<tr>
<td><strong>Code</strong></td>
</tr>
<tr>
<td>Textual Content</td>
</tr>
<tr>
<td>Associated Item</td>
</tr>
<tr>
<td>T1</td>
</tr>
</tbody>
</table>
الطبيعة البلورية

بصورة عامة تأخذ الأملاح عندما تكون في الحالة الصلبة شكل بلورات أو حبيبات بلورية، شفافة أو عاتمة، عديمة اللون أو ملوّنة.

<table>
<thead>
<tr>
<th>T2</th>
<th>قابلية الأحلاف في الماء</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>نتائج تجريبي</td>
</tr>
<tr>
<td></td>
<td>نضع في دورق قليلاً من الماء المقطر ونغمس فيه سلكين من الحديد، ثم نصل بين السلكين بواسطة مولد كهربائي ومصباح. نلاحظ أن المصباح لا يتوهج.</td>
</tr>
<tr>
<td></td>
<td>نضيف قليلاً من كلور الصوديوم إلى الماء المقطر. فنلاحظ أن المصباح يتوهج.</td>
</tr>
<tr>
<td></td>
<td>نتيجة: المحلول المائي للملح كلور الصوديوم ينقل التيار الكهربائي.</td>
</tr>
<tr>
<td></td>
<td>في المحاليل الملحية، تتشرد جزيئات الملح إلى شوارد سالبة وشوارد موجبة.</td>
</tr>
<tr>
<td></td>
<td>عندما نغمس في المحلول سلكين معدين ونصلهما بطرفين مولد كهربائي، تتحج الشوارد السالبة إلى السلك أو المسرى المتصلك بالقطب الموجب للمولد الكهربائي (المصعد)، وتتجه الشوارد الموجبة إلى السلك أو المسرى المتصلك بالقطب السالب للمولد الكهربائي (المهبط).</td>
</tr>
<tr>
<td></td>
<td>نتائج: نتقل المحاليل الملحية للأملاح التيار الكهربائي.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>T3</th>
<th>النافلية الكهربائية</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>نشاط تجريبي: نضع في دورق قليلاً من الماء المقطر ونغمس فيه سلكين فرنسيتين من الحديد، ثم نصل بين السلكين بواسطة مولد كهربائي ومصباح. نلاحظ أن المصباح لا يتوهج. نضيف قليلاً من كلور الصوديوم إلى الماء المقطر. نلاحظ أن المصباح يتوهج.</td>
</tr>
<tr>
<td></td>
<td>نتيجة: المحلول المائي للملح كلور الصوديوم ينقل التيار الكهربائي.</td>
</tr>
<tr>
<td></td>
<td>في المحاليل الملحية، تتشرد جزيئات الملح إلى شوارد سالبة وشوارد موجبة.</td>
</tr>
<tr>
<td></td>
<td>عندما نغمس في المحلول سلكين معدين ونصلهما بطرفين مولد كهربائي، تتجه الشوارد السالبة إلى السلك أو المسرى المتصلك بالقطب الموجب للمولد الكهربائي (المصعد)، وتتجه الشوارد الموجبة إلى السلك أو المسرى المتصلك بالقطب السالب للمولد الكهربائي (المهبط).</td>
</tr>
<tr>
<td></td>
<td>نتائج: نتقل المحاليل الملحية للأملاح التيار الكهربائي.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Description (or the image itself)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I1</td>
<td>كلور الصوديوم</td>
<td>![صورة للكلور الصوديوم]</td>
</tr>
<tr>
<td>I2</td>
<td>كبريتات النحاس</td>
<td>![صورة للكبريتات النحاس]</td>
</tr>
<tr>
<td>Code</td>
<td>Title</td>
<td>Description</td>
</tr>
<tr>
<td>------</td>
<td>-------</td>
<td>-------------</td>
</tr>
</tbody>
</table>
| A1   | انحلال كلور الصوديوم في الماء | ومغمر فيه 100 mL، يظهر وعاء يحوي كمية من الماء يكتب عليها 100 mL، وتضيف بشكل تدريجي ملحاً أبيض 25°C ميزان حرارة يشير إلى يكتب عليه كلور الصوديوم وتيتين عملية التحريك ضمن الوعاء عن طريق قضيب صغير. نبين أن المحلول يبقى متجانساً (لا توجد فيه حبيبات ملحية غير منحلة)، ثم تبدأ الحبيبات الملحية البيضاء بالتركم في أسفل الوعاء. نكتب تحت الوعاء "انحلال كلور الصوديوم في الماء في الدرجة 25°C تساوي 36 g في 100 mL.

يظهر في الأسفل عدد عبوات كمية الملح المضافة مقدرة بالغرام، ويبدأ تراكم الحبيبات عند القيمة 36.

الإضافة تجري على دفعات: 10, 10+10, 10+10+10, 10+10+10+10+10 مع وضع عبارة توضح كمية الملح المضافة. |
• Content Review and Validation

Each learning unit description must be reviewed and validated in order to guarantee the correctness of this unit before any further steps. This mustn’t exclude the comprehensive review activity that is needed to be applied on each learning object description, and to check the validity of the learning object from all perspectives as defined in the content review and validation strategy. Any needed modifications must be done before the validation.

• Storyboard Design

A storyboard must be prepared for each validated learning object. This is normally prepared by the Instructional Designer, and it must be validated according to the storyboard strategy stated before. Learning Object Storyboard is the final output of the design phase and the input for the development phase. Table-3 shows an example of a Learning Object Storyboard Form (the learning object is divided into several slides and each slide is described using a storyboard form).

Table 5 - Example of a Learning Object Storyboard Form

<table>
<thead>
<tr>
<th>Learning Object Title</th>
<th>خصائص الأملاح والمحاليل الملحية</th>
<th>Slide No</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning Object Title</td>
<td>خصائص الأملاح والمحاليل الملحية</td>
<td>Slide No</td>
<td>4</td>
</tr>
<tr>
<td>Text</td>
<td>Text</td>
<td>Code</td>
<td>Textual Content</td>
</tr>
<tr>
<td>Code</td>
<td>Textual Content</td>
<td>Associated Item</td>
<td></td>
</tr>
<tr>
<td>TP1</td>
<td></td>
<td></td>
<td>النقلية الكهربائية</td>
</tr>
<tr>
<td>TP2</td>
<td></td>
<td></td>
<td>نشاط تجريبي</td>
</tr>
<tr>
<td>TP3</td>
<td></td>
<td>A2-1</td>
<td>نضع في دورق قليلاً من الماء المقطر ونغمض فيه سلكين من الحديد، ثم نصل بين السلكين بواسطة مولد كهربائي ومصباح</td>
</tr>
<tr>
<td>TP4</td>
<td></td>
<td>No Change</td>
<td>نلاحظ أن المصباح لا يتوهج</td>
</tr>
<tr>
<td>TP5</td>
<td></td>
<td>A2-2</td>
<td>نضيف قليلاً من كلور الصوديوم إلى الماء المقطر</td>
</tr>
<tr>
<td>TP6</td>
<td></td>
<td>No Change</td>
<td>نلاحظ أن المصباح لا يتوهج</td>
</tr>
<tr>
<td>TP7, TP6 must disappear</td>
<td></td>
<td></td>
<td>النتيجة</td>
</tr>
<tr>
<td>TP7</td>
<td></td>
<td></td>
<td>المحلول المائي لملح كلور الصوديوم ينقل التيار الكهربائي</td>
</tr>
<tr>
<td>TP8</td>
<td></td>
<td></td>
<td>في المحاليل الملحية، تتشرد جزيئات الملح إلى شوارد سالبة وشوارد موجبة</td>
</tr>
<tr>
<td>TP7, TP8 must disappear</td>
<td></td>
<td></td>
<td>النتيجة</td>
</tr>
<tr>
<td>TP9</td>
<td></td>
<td>A3</td>
<td>عندما نغمض في المحلول سلكين معدنين ونوصليهما بشرير مولد كهربائي تتجه الشوارد السالبة إلى السلك أو المسرى المتصوطة بالتقطب الموجب للمولد الكهربائي (المصعد) وتتجه الشوارد الموجبة إلى السلك أو المسرى المتصوطة بالتقطب السالب للمولد الكهربائي (المهبط)</td>
</tr>
<tr>
<td>TP9 must disappear</td>
<td></td>
<td></td>
<td>النتيجة</td>
</tr>
<tr>
<td>TP10</td>
<td></td>
<td></td>
<td>توزع حركة الشحنات الكهربائية إلى مرور التيار الكهربائي</td>
</tr>
<tr>
<td>TP11</td>
<td></td>
<td></td>
<td>النتيجة</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>نقل المحاليل المائية للأملاح التيار الكهربائي</td>
</tr>
</tbody>
</table>
**A2-1** نقلية المحلول المائي لملح كلور الصوديوم للتيار الكهربائي

حوض فيه ماء مقط عموس فيه سلكان من الحديد، نبين اننا نصل بين السلكين بواسطة مولد كهربائي (يظهر قطبا الموجب والسالب) ومصباح، فلا يتوهج المصباح.

**A2-2** نقلية المحاليل الملحية للأملاح للتيار الكهربائي

نصيف إلى أثاث المقط حفنة من بلورات بيضاء كتب عليه كلور الصوديوم NaCl، ونين أن المصباح يتويج.

**A3** نقلية المحاليل الملحية للأملاح للتيار الكهربائي

نقرب النوعي الموجود في الإحياء A الذي يحتوي محلول كلور الصوديوم NaCl، ونين أن المحلول يحتوي شوارد كلور السالبة Cl⁻ وشوارد الصوديوم الموجبة Na⁺ (بالإضافة إلى جزيئات ماء).

نين أنه عند إغلاق الإدارة تتجه الشوارد السالبة نحو السلك أو السري المتصل بالقطب السالب للمولد الكهربائي وتنتج الشوارد السالبة إلى السلك أو السري المتصل بالقطب الموجب للمولد الكهربائي ويضيء المصباح.

**Development**

This phase contains all the required activities for building the content and preparing it for delivery via a standard LMS and indexing it in a standard content repository (Learning Object Repository - LOR) too. This phase consists of two main sub phases as shown in Figure-3:

- **Content Development**
  - **Learning Object Technical Implementation**
    At this stage, the learning object is realized as described in its storyboard form. This includes preparing or implementing any needed multimedia resources (assets), and implementing the learning object as a whole, in addition to any technical issues that are necessary to make the learning object compatible with the applied standard (for example: publishing the object as a SCO to make it SCORM-compliant).

  This work is normally done by a technical implementer and a graphics designer. Figure-4 shows a snapshot of an implemented learning object.

- **Learning Object Review and Validation**
  Although, the learning object description has been reviewed and validated before, the resultant object must be reviewed again and
validated in order to check the total quality before publishing. This stage is critical to check if the object is convenient from a scientific perspective and from a learner perspective as well.

**Fig 4 - The Development Phase**

- **Learning Object Technical Testing**
  The goal of this stage is to check the technical validity of the implemented object from a general perspective and from the applied standards perspective.

- **Learning Object Metadata Finalization**
  As mentioned before, some metadata elements are determined during the authoring and description phase, which includes the general and educational elements according to the LOM standard. At this stage, the learning object is valid and final, so it is time to determine the technical metadata elements. In addition, other elements could be provided at this stage such as: Life Cycle, Relation, Classification and Meta Metadata Elements. Figure-5 shows only the General part of the metadata of
the RLO illustrated in Figure-2.

- Learning Object QA
  The quality assurance specialist must review all the filled forms till the previous stage of design, and must examine carefully the implemented learning object.

- Content Aggregation
  In this phase, the prepared learning objects are aggregated into the learning units specified before. Normally, aggregation is done only for those units that may be delivered via an LMS as a single package. Other top level units are normally aggregated as learning paths on the LMS.
    - Learning Unit Building
      The input for this stage is: the Learning Unit Description Form, and the validated learning objects that are determined for this unit. Learning objects are grouped according to the defined structure of the unit, also sequencing and navigation constraints are applied. This work is done according to the applied eLearning standard SCORM.
    - Learning Unit Review and Validation
      Although, the Learning Unit Description is reviewed and
validated before, the resultant unit must be reviewed and validated in order to check the total quality before publishing. However, this review is normally done on the LMS basically to check the sequencing and navigation.

- Learning Unit Technical Testing
The goal of this stage is to check the technical validity of the implemented unit from a general perspective and from the applied standards perspective.

- Learning Unit Metadata Finalization
Before sending the resultant output to the quality assurance specialist we must finalize all metadata for all objects in all levels.

- Learning Unit QA
The quality assurance specialist must do a final check on all previous stages.

---

Fig 6 – General Metadata of the RLO in Figure-2

- Implementation
In this phase, the learning content must be ready for delivery via an LMS. But, before the delivery in the real context, this content must be tested in the intended context on a group of the intended learners.

- **Evaluation**
  During the real implementation of the content in the real context, learners and tutors are invited to fill different forms of evaluation about the content. This feedback is very important to enhance the quality of the content in the future.

**ePedia-Sy Delivery Methodology**

As mentioned before, a delivery strategy must be determined while planning the instructional strategy. Delivery strategy must comply with the pedagogical-instructional requirements of the intended content, learners and the context of learning. In this section, we present a sample delivery strategy that is compliant for delivering educational supportive eLearning content in an educational context. This strategy addresses three main issues: content structure, sequencing of RLOs, learner assessments. A new concept is needed to be introduced here is the Unit of Study; it is one of the learning content components (equivalent to what we’ve called previously a delivery unit), defined in the instructional strategy, that will be delivered to the learner as a single unit at a time (or at a single session). The structure of this unit is defined as illustrated in Figure-5. It’s the same organization defined in the content component model with a specific structure according to the type of learning objects:

- A pre-assessment object is scheduled at the beginning in order to give the learner hints about key concepts that will be learned during the session;
- A consecutive learning objects are aggregated according to the component model;
- An exercise object is scheduled after the ideas to help the learner to understand more the must-be learned concepts;
- A post-assessment object that measures the learner understanding is scheduled at the end of the Unit of Study.

This structure must be applied according to the SCORM Content Aggregation Model (CAM). For this purpose, the Unit of Study is represented as a SCORM organization that will be delivered as a SCORM package.

On the other hand, the sequencing and navigation of RLOs, considering the previous structure, must be in the following order:

- When the learner views a certain package, the pre-assessment object will be delivered. The learner can browse it and then he/she can go to the next item at any time;
- After the first step, and during the browsing of the RLOs dedicated to explain concepts (i.e. before reaching
the post-assessment object), the learner can only go to the next item or to the previous one;

- After the all non-assessment objects are visited, the learner can go to the post-assessment object;
- The post-assessment object and the pre-assessment object could be viewed only once;
- After respecting the previous sequencing the learner can view the non-assessment objects for unbounded number of times

These sequencing and navigation constraints must be applied to the structured organization according to the SCORM Sequencing and Navigation (SN). Figure-7 shows the representation of a Unit of Study (here it is a Chemistry Lesson for the 9th grade) as a SCORM package.

All assessment and exercise objects are composed of assessment items. Any assessment item could be of one of the following types: multiple choice, drag and drop, fill in the blank, true-false and matching, etc. Each assessment item has its own scenario according to its type and to its position. If it’s a test item inside a pre-assessment, it will be presented with a feedback on failure and congratulation on success. If it’s an exercise item, it will be presented (after a fixed number of allowed attempts) with an answer, a feedback on failure and congratulation on success. If it’s a test item within a post-assessment, it will be presented for one attempt only with no feedback.
<table>
<thead>
<tr>
<th>شروط قابلية</th>
<th>عمليات</th>
</tr>
</thead>
<tbody>
<tr>
<td>الدورة الأولى - إضافة إلى ملف العمل</td>
<td>معلومات</td>
</tr>
<tr>
<td>الدورة الأولى - أنواع التفاعلات الكيميائية</td>
<td>معلومات</td>
</tr>
<tr>
<td>الدورة الثانية - تحليل الأملاح</td>
<td>معلومات</td>
</tr>
<tr>
<td>الدورة الثالثة - تحليل الأملاح</td>
<td>معلومات</td>
</tr>
<tr>
<td>الدورة الرابعة - تحليل الأملاح</td>
<td>معلومات</td>
</tr>
<tr>
<td>الدورة الخامسة - الكيمياء الفائقة</td>
<td>معلومات</td>
</tr>
<tr>
<td>الدورة السادسة - الكيمياء المدوية</td>
<td>معلومات</td>
</tr>
<tr>
<td>الدورة السابعة - الطاقة والتكنولوجيا</td>
<td>معلومات</td>
</tr>
</tbody>
</table>

Fig 9 - Units of Study Organization on the LMS
These assessment items must be applied according to the SCORM Run-Time Environment Data Model, and more specifically the Interactions Data Element.

The organization of the units themselves inside upper unit levels is the responsibility of the LMS. The organization here adheres to the defined learning components model too, and it’s an aggregation of the Units of Study in addition to assessment objects. The sequencing for these units must be in the following order:

- The learner can navigate the organization until reaching the Units of Study;
- For the first Unit of Study, if there is no pre-conditions, it could be viewed by the learner;
- For other units, a pre-condition is set to prohibit the access to this unit if the learner didn’t succeed in the previous one. Learner success in a unit is determined according to his performance in its post-assessment.

Figure-8 shows the representation of the Chemistry curricula for the 9th grade as an LMS organization.
Conclusion
In this paper, we have presented a comprehensive approach for building eLearning Arabic Content. This approach is based on the concept of Reusable Learning Objects as an intersection area to combine the instructional design and the educational standards in order to produce a standard eLearning content that is ready for delivery via a standard Learning Management System. This approach has been implemented and tested on developing more than 800 RLOs in different fields of Pre-University curricula such as: Algebra, Geometry, Chemistry, Physics, and Biology and for different levels from 5th grade to 9th grade. Our perspective is to complete this work to cover all the educational standards for all levels of study at the Pre-University curricula. Upon our estimations we need to develop about 15000 RLOs in Arabic language. These RLOs will be stored and indexed in a repository that might be one of the major resources for eLearning Content in the Arab countries.
References


Distributed e-Learning Using the RTF Middleware

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BMT Cordah Ltd. Southampton, UK

Abstract

We develop a novel e-learning technology that enables a frequent, real-time interaction between students and instructors. Our target use case is the maritime search and rescue e-learning software developed by BMT Cordah Ltd. for national coast guards. We report on the prototype implementation of our technology, based on the RTF (Real-Time Framework) middleware. The e-learning software becomes deployable as a service accessible from worldwide locations via the Internet. Course sessions can be started dynamically on demand while RTF automatically and transparently takes care of the necessary distribution and communication and assures that the e-learning service runs on appropriate resources which provide the capacity, latency and bandwidth required by the application service. This allows the e-learning provider to conduct courses by requesting resources on demand, instead of expensive own resources hosting.

Keywords: e-learning, RTF (Real-Time Framework), on-demand resource management.

Introduction

This paper presents a novel approach for implementing highly interactive e-Learning Applications (ELA) using the Real-Time Framework developed within the edutain@grid project. The Real-Time Framework (RTF) provides an efficient support for distributed computation and communication. In this paper, a specific e-learning middleware is developed using the Real-time Framework. This middleware encapsulates commonly needed functions for e-learning systems and thus facilitates a comfortable and efficient development of new e-learning products acting in a distributed Internet-based environment.

The work described in the paper was conducted in cooperation between the University of Muenster and BMT Cordah Ltd. (BMT) - a commercial company offering consultancy and software. In particular, the marine sector department of BMT develops an e-learning system which will enable the company to hold distance learning courses for one of its main maritime software products.

RTF is being developed within the edutain@grid project as a platform for designing and executing Real-Time Online Interactive Applications (ROIA). The distributed computation and communication in ROIAs have to be highly responsive to allow frequent user interaction. Examples of ROIAs are Massively Multiplayer Online Role-Playing Games (MMORPG) in which a
large group of players actively interact in a virtual environment via the Internet. RTF frees the developer of a ROIA from complicated low-level programming, e.g., network transmission via sockets. The RTF is implemented as an object-oriented C++ library with a comfortable user API. In this paper, we demonstrate that modern e-learning applications, including BMT’s distance learning use case, can be handled as ROIA and thus strongly benefit from using RTF for their development.

**e-Learning: Example Application and Requirements**

This section describes a particular case study which we use in the paper to present the use of RTF for developing e-learning applications, taking into account their specific requirements.

**Case Study: E-Learning for SARIS**

We consider a particular use case of e-learning for the Search and Rescue Information System (SARIS) of BMT. Fig 2.1 shows a screenshot of SARIS as used by coastguards, navies and port authorities. It allows these organisations to manage incidents, for example, if a seaman is falling overboard. To react on such an incident, it is important to estimate where the target (for example the seaman) is, which is done by SARIS based on environmental data in which area the target could be. Available rescue units, for example helicopters, can then be provided with the most efficient search patterns to find the target. The operation of SARIS has to be taught in courses in order to use it properly.

![Fig 2.1: SARIS screenshot](image)

Up to now the courses are held at BMT Cordah's site or at a customer's facility, such that either the course attendees or instructors have to travel. The use of distance learning on the Internet will reduce the overall costs of training: Instructors and course attendees will
use the software at their workplace. The software, called e-learning system in the following, enables users to interact with other users in the same way as they would do in an ordinary course. It is possible to interact with an instructor or other attendees, watch simulations of Search and Rescue (SAR) incidents and hold or mark examinations. The data, which has to be exchanged between attendees and instructors, is transmitted via the Internet. There is a simulation which can be controlled by the instructor or the course attendees.

**Requirements Analysis for SARIS**

BMT is going to use the e-learning system described here to hold distance learning courses over the Internet. The e-learning system requirements give an overview of the functions of a client based on the e-learning middleware. This information was gathered by interviewing BMT's staff and analysing BMT's pre-prototype e-learning client. Furthermore, requirements described in 0 were used. The system should enable BMT to host their training courses on the Internet and to manage customers, hold courses or tests and evaluate results. The target audience is employees of BMT's customers, as well as employees of BMT. The people interacting with the system are depicted in the actor hierarchy (see Fig 2.2).

BMT's administrators create customer accounts and grant access to courses or tests. An instructor creates lessons and starts them. During a lesson he is also able to communicate with customers over several channels such as text communication and to modify the lesson scenario as needed (e.g. trigger additional incidents). Employees of the customers can join ordered lessons and communicate with other students or the instructor. Furthermore, they can take a test. Managers of the customer's company can fetch test results to rate employees' abilities. All users are subtypes of the actor User, i.e., are able to interact with the system. The subactors of User are Administrator, Course Attendee and Attendee's Supervisor. The Administrator is responsible for management tasks and is able to enforce business contracts, signed with customers, in the system. A Course Attendee is the user that is mainly interacting with the system. Basically, he is an employee of the customer's organization who takes part in e-learning sessions. A special subtype of the Course Attendee is the Instructor who is responsible for administrative intervention in e-learning sessions. Furthermore, he has the same possibilities as a customer's employee and is therefore an extended subactor of the Course Attendee.
The actors of the system can use a set of product functions. Table 2.1 summarizes the most important functions of the e-learning system.

Functions F01, F02 and F10 of Table 2.1 describe the requirements on the system to manage users. The User, and thus every actor, can use the functions F01 and F02 which offer the possibility to log in and out of the system. The Administrator has to use the function F10 to add new users. He is furthermore responsible for creating lessons by using function F20. Then, these lessons are accessible for Instructors. Instructors can start lessons by invoking F31. Moreover, a Course Attendee actor can join a started lesson with function F40 and then communicate with other attendees by using F41. Each lesson participant taking part in a communication has to receive the sent information at the same time. This requirement is essential to simulate the lessons which were formerly held personal. Besides communication, F42 gives the possibility of looking at simulations, which have to be displayed at each client at the same time too. For example, a simulation could be the interactive management of a Search and Rescue incident. To give these simulations a realistic feeling, F43 allows modifying a scenario by a certain user.
Table 2.1: Product Functions

<table>
<thead>
<tr>
<th>Identifier</th>
<th>Name</th>
<th>Objective</th>
<th>Actor(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>F01</td>
<td>Login</td>
<td>A user logs onto the system</td>
<td>User</td>
</tr>
<tr>
<td>F02</td>
<td>Logout</td>
<td>A user logs off the system</td>
<td>User</td>
</tr>
<tr>
<td>F10</td>
<td>Create User</td>
<td>Create account to connect to the system</td>
<td>Administrator</td>
</tr>
<tr>
<td>F20</td>
<td>Create Lesson</td>
<td>Create a lesson and grant an instructor to configure a lesson</td>
<td>Administrator</td>
</tr>
<tr>
<td>F22</td>
<td>Invite Attendee</td>
<td>Grant students access to a lesson</td>
<td>Instructor</td>
</tr>
<tr>
<td>F31</td>
<td>Start Lesson</td>
<td>Enable Instructors to perform trainings, examinations or role-plays</td>
<td>Instructor</td>
</tr>
<tr>
<td>F40</td>
<td>Join Lesson</td>
<td>An attendee takes part in a lesson</td>
<td>Course Attendee</td>
</tr>
<tr>
<td>F41</td>
<td>Communicate</td>
<td>Communication between users via real-time message processing</td>
<td>Course Attendee</td>
</tr>
<tr>
<td>F42</td>
<td>Watch simulations</td>
<td>An actor looks at a simulation controlled by another actor</td>
<td>Course Attendee</td>
</tr>
<tr>
<td>F43</td>
<td>Modify scenario</td>
<td>Attendee modifies the scenario</td>
<td>Course Attendee</td>
</tr>
</tbody>
</table>

**Real-Time Framework (RTF): Principles and Applications**

In this section, we describe the Real-Time Framework, explain its main design principles and survey the main areas of its application.

**RTF as Part of Edutain@Grid**

The European edutain@grid project develops a distributed architecture that allows the development, business management and hosting of interactive distributed applications. With this architecture, distance learning can use the on-demand hosting feature; there is no need to have one's own hosting infrastructure. The maximum possible number of users using a ROIA can be negotiated with a hoster, which will then provide the needed computing performance and bandwidth at the time contracted. These services are enabled by the Business and Management Layer of edutain@grid. The ROIAs themselves are executed in the Real-Time Layer of edutain@grid, with RTF in the middle, using assigned resources.

A typical application consists of a client application and a ROIA-Process. Users use the client application to connect to the ROIA-Process and send to it their inputs which directly influence the application state. The application state is received by each client connected to the ROIA-Process. This process is highly responsive for a user: it takes only a few milliseconds between sending the inputs and receiving a new state. ROIAs allow a large group of users distributed over the Internet to use them in this interactive way. ROIA-Process and client application development is provided by the Real-Time Framework.

The message transmission mechanism of RTF enables developers to exchange events between client applications and ROIA-Processes. An event is a C++ object which is prepared to be network transmittable. Once an event is sent, RTF enqueues it in an event queue of the receiver. The receiver can then poll the queue to access the event. In addition to message transmission, RTF provides a state transmission mechanism. This mechanism transfers continuously the state of an object, which is created in the ROIA-Process, to clients. An object, whose state will be transmitted, has to be prepared by adding serialization information. The clients that receive the state, can use the object similarly as they would use a locally created object. The only difference is that a client cannot alter the state of the object.

The computation of the states transferred to clients and messages sent between ROIA-Processes and client applications are handled...
in real-time loops. The Server real-time loop is responsible to process the state of the ROIA-Process; the Client real-time loop processes the state of the client application. The Server real-time loop processes the state of a ROIA in a sequence of ticks. The Client real-time loop enables the client application to process the received messages and states.

**e-Learning Application: Towards using RTF**

Fig 3.1 shows the common structure of a simple e-Learning Application (ELA). The ELA provider operates a server. A customer, who wants to use an ELA, connects to the server with a client application. The ELA provider also uses an ELA management application connected to the server which allows him to control a collaboration session. Data is sent via the Internet to the clients. Therefore, there has to be a connection to each participating client.

This causes a linear relationship between the number of attendees and bandwidth: the ELA provider has to operate a server with enough bandwidth to allow the maximum of clients to connect. If there is only a small group of users collaborating, the majority of the bandwidth kept ready would not be used. Furthermore, connected clients create computational load at the server depending on the number of attendees as incoming messages have to be processed. For a realization of such a system, the developer might use a system like the Common Object Request Broker Architecture (CORBA) 0 for C++ or Remote Method Invocation (RMI) 0 for Java. These solutions basically provide Remote Procedure Calls (RPC) that allows calling procedures of an object located on another host. Since both systems, CORBA and JAVA RMI, require technicalities as for example creating a description of the distributed class in an interface definition language, the implementation of an ELA is a challenging task. Furthermore, access control mechanisms have to be implemented and the user management functions have to be created. All in all, the simple approach of Fig 3.1 has the disadvantage of inflexibility and demanding implementation.

To overcome the described limitations, Fig 3.2 demonstrates an ELA system which takes the edutain@grid approach. There is a client application, the ELA management client, which is used by the employees at the ELA provider's site. This client is connected via the Internet to an edutain@grid ROIA-Process. The ROIA-Process is executed at a hoster's site. The customer's ELA client applications are then directly connected to the ROIA-Process. The hoster is responsible for delivering the processing power and bandwidth needed for the collaboration. Therefore, the ELA Provider does not have to have its own infrastructure, which could be idle most of the time.
Even if the edutain@grid approach gives an ELA provider an efficient possibility to host their service, there still remains the challenge of distributed implementation: the ROIA-Process and the client application have to be developed manually. Therefore, a specific application middleware based on RTF was developed which simplifies the usage of the edutain@grid approach. The next section is analysing the requirements on this middleware.

**Requirements Analysis**

This section presents a set of requirements on the e-learning middleware. Initial requirements are based on BMT’s e-learning software that is being created for a maritime search and rescue training. The middleware has to support a wider range of applications than the e-learning system: an application class which enables a large group of users to collaborate on a certain topic. Users work with client applications which enable them to take part in the collaboration. These clients are connected with each other via the Internet. Firstly, let us discuss which actors take part in the collaboration supported by the middleware.

The actors using ELAs are Session Creator and Session Attendee. A Session Creator creates and manages the collaboration supported by ELAs. The process of collaborating is called Session. In the e-learning system, the Session Creator use cases are used by the Administrator and Instructor actor. The Session Attendee joins a Session and takes part in the collaboration. In the SARIS example of BMT the use cases of this actor are used by the Instructor and Course Attendee actors.

The middleware requirements are gathered by generalizing the SARIS example use cases of BMT into general ELA use cases. The generalization is shown in Fig 4.1 and Fig 4.2. Each figure is structured as a use case diagram which depicts the interaction of an actor with the system. The ELA actors on the left-hand side interact with the ELA in the
centre of the figure. Each e-learning oriented use case is connected by an include tag with a generic use case on the right-hand side which is realized by the generic middleware functions.

The Session Creator use cases are depicted in Fig 4.1. Create Session allows a Session Creator to prepare a collaboration. It uses the middleware’s Configure Session use case as well as the Delete Session does. Furthermore, a Session Creator can configure users which take part in collaboration. Therefore, there are Create User, Alter User and Delete User use cases. Start Session is used by the Session Creator to begin the collaboration. For example, this could be the beginning of a maritime safety course in the e-learning system. This use case includes the Prepare Session use case of the middleware. Before starting a session, the Session Creator uses the Prepare Session use case.

The session managed by the use cases described above is used by the Session Attendee. Fig 4.2 shows his use cases. The Session Attendee takes part in the collaboration by joining a session (Join Session). It includes the Start Collaboration middleware use case. The collaboration itself is given by the use cases Experience Session and Manipulate Session. Experience Session describes the visualisation of collaboration subjects in the client application, e.g., a moving ship in the maritime safety e-learning system. Therefore, the Experience Session use case includes the Receive Message and Distribute Regulated Item use case of the middleware. A Session Attendee can influence the collaboration by using Manipulate Session. This allows him to alter the collaboration subject. Manipulate Session also includes the Distribute Regulated Item use case. Furthermore, Send Message is included.
The middleware use cases to be used by application developers can be grouped into categories and are divided into a configuration and communication subsystem. Fig 4.3 highlights the functional breakdown of the system. This division is chosen to simplify the development of an application which is based on the middleware. Configuration functions are used to configure parameters that are necessary before collaboration starts. For example, users have to be added in advance of starting a session to grant them access to the session. Then, the communication functions allow the collaboration in the system.

**Configuration Functions**

The use case diagram in Fig 4.4 describes the configuration functions. All configuration information needed by the communication functions is provided before using the communication related use cases. This enables a developer of an ELA concentrate on the implementation of communication related tasks in the client application. The design goal for the configuration functions is their minimal intrusion into client development concepts.

- **Configure Session** configures the middleware to be used by a certain ELA. Therefore, the configuration of each middleware component has to be set up with the information necessary to start the session. The session configuration is not handled by explicit middleware calls. It is realized through configuration files that are automatically read when a client application is started.

- **Register Regulated Item** enables the developer to register the objects which are subject of the collaboration on the middleware side. Once the developer registers the Regulated Item, the middleware provides mechanisms to transfer its state to the participating clients. A detailed description of using
Regulated Items is given in 0. The authorisation related tasks of Regulated Items are controlled in the following Receiver Management use case.

- Receiver Management describes the need to regulate which connected client receives Regulated Items.

Therefore, there has to be a concept to control the users taking part in collaboration as well as which Regulated Item appears at a certain client. The items have to be provided by Register Regulated Item in advance before they can be managed.

**Fig 4.4: Configuration use cases**

- Manage User allows an application to alter user details. The access rights to sessions and authentication options are set by this use case. The use cases Delete User and Add User remove the user details or create initial values.
- Authenticate describes the possibility to authenticate a client at the system. Therefore, there has to be the possibility to provide credentials. Based on the information provided in the Configure Session use case, the system can then decide if the credentials are valid. If a client is authenticated, access can granted to the client on certain application parts by using the Receiver Management use case.

**Communication Functions**

The use case diagram in Fig 4.5 describes the communication functions of the middleware.

- Start Collaboration starts the preconfigured collaboration. It is used to connect a client application to the collaboration session. This use case automatically sets up the session in a way required by the actor using the client. If the Course Attendee client uses Start Collaboration, a connection to the Collaboration Session is established.
Fig 4.5: Communication use cases

- **Distribute Regulated Item** describes the middleware capability to distribute the state of a Regulated Item at runtime. For example, a Regulated Item could be a chart which contains search and rescue incidents in a maritime safety system. To enable the automatic distribution, an item must have been registered previously by the Register Regulated Item use case.

- **Send Event** allows an application to send status messages in a simple format to a group of clients. It is used to notify other clients about alternations of a Regulated Item. For example, in the e-learning system for the maritime safety sector this function can be used if a new element is inserted on a sea map.

- **Receive Event** enables the application to receive messages sent by the use case Send Message. It notifies the application about the event reception. For example, a received event which represents a changed state of the e-learning scenario should cause the redrawing of GUI elements.

- **Check Authorisation** controls if the use case is used by an authorised user

**Middleware Structure and Concepts**

The concepts figured out by the middleware use cases define a set of features necessary to implement an ELA. The implementation of these features has to take into account the given technical platform. The technical platform consists of the Real-Time Framework (RTF) which is implemented as well as the middleware in C++. The language was chosen as the targeted applications, i.e., games and interactive e-learning applications are often realized in C++ because they are highly optimized and require fast response times. The use cases provided also hide the ROIA-Process from the application developer and only require the implementation of the client application. The developer only uses library calls offered by the middleware API. The concept of hiding the ROIA-Process is regarded as the black-box in the following.
In general, the aim of a middleware is to provide a programming abstraction as well as masking the heterogeneity of the underlying system. Since our e-learning middleware is based on RTF, the heterogeneity of the system is already masked and programming abstraction is the primary concept of the middleware. The application developer should be able to concentrate on the business logic or GUI design rather than applying mechanisms to implement distribution. For example, replicating the state of a text field among clients should be possible without registering a state on a middleware management class. As Fig 4.7 depicts, a client is communicating via RTF with a generic CC-ROIA-Process. This process is responsible to manage the distribution of Distributed Attributes. Furthermore, it implements the enforcement of security mechanisms because if security would be enforced on the client site a modification of the client program could compromise overall security. Therefore, the CC-ROIA-Process in Fig 4.7 includes an Authorisation Manager and an Authentication Manager. The Authentication Manager checks if a connection to the Session is granted and it identifies the user that attempts to connect (by means of the user’s credentials). The Authorisation Manager controls the access on
Distributed Attributes and denies, e.g., an unauthorized modification attempt of a client. The middleware is platform-independent and using the Boost libraries (e.g., for multithreading support). The implementation is tested on both Windows XP with the Visual Studio C++ compiler, and on Ubuntu Linux 8.04, using the GCC C++ compiler version 4.2.

![Fig4.7: Overview of ELA based on the middleware](image)

**Demonstrator**

This section describes the implementation of ELA Demo - a demonstrator system based on the presented middleware. The basic idea of ELA Demo is BMT’s e-learning system for maritime safety training and it reassembles the basic functionality that is provided by BMT’s e-learning system:

- Users can chat about search patterns shown on a Graphical User Interface (GUI).
- Users can see a map which displays the actual incident within the GUI.
- Users can add overlays to the map which, e.g., show a search pattern that is proposed by one of the course attendees.

The GUI, as shown in Fig 5.1, consists of a main window which draws a map which is distributed via a Distributed Attribute among the participating clients. Furthermore, there is a chat window, which allows students and instructors to communicate (below the map). Collaboration is supported by adding overlays to an overlay list (shown on the right site). This list is distributed via DistributedVectors among the clients. The GUI of this demonstrator is implemented by using WxWidgets, a cross platform GUI toolkit. Maps and overlays are implemented using WxArt2D.
The Map Window shows a sea map of the simulated area. Each connected client application shows the same map. It is loaded by the Session Creator at startup. The map is stored in the Scalable Vector Graphics (SVG) format and can be read into a character string. This mechanism is used by ELA Demo to distribute it among clients. The Chat Textbox demonstrates the update listener concept provided by the middleware. It allows a user to enter text in a Textbox which is then displayed at each client in the system. The overlay list enables a user to display search patterns on the map.

The demonstrator is deployed by starting the generic CC-ROIA-Process. Its config.xml configuration file includes the credentials of the instructor. Once the CC-ROIA-Process is started, the instructor connects to the CC-ROIA-Process and authenticated against his credentials. After the instructor is authenticated, he can add the credentials of students which should be able to participate in the session. All clients that connect to the CC-ROIA-Process are authenticated against these credentials.
Fig 5.2: Client displaying an overlay
Conclusion

The e-learning system of BMT described in this paper is an example of a system that allows collaboration over the Internet instead of face-to-face communication. It is used in this paper to find and define the basic functions of a supporting middleware for e-learning applications.

This paper presented the design and implementation of a middleware for e-learning. The requirements analysis of the BMT e-learning system was conducted. This system will enable BMT Ltd. to hold distance learning courses. Instructors and Course Attendees use an e-learning software system at their workplace to interact with other users in the same way as they would in an ordinary course. These requirements were used to design a middleware which supports the development of ELAs.

The middleware consists of distributed datatypes, an authorisation concept and a generic server process responsible for managing these functions. The distributed datatypes are capable of automatic state replication among participating clients. These datatypes, called Distributed Attributes, enable the application developer to write classes whose state is globally accessible. They allow developers to use them in the same way as they would use ordinary datatypes. Therefore, distribution mechanisms were integrated into the datatypes class definition. Furthermore, the CC-ROIA-Process was developed. It is a generic server process for collaboration centric applications. This process is able to process status updates and management tasks. Besides the foundation of distribution mechanisms, there is a basic authorisation system which allows controlling the access of users on Distributed Attributes.

The applicability of the middleware was proven by a demonstrator e-learning system. This system allows displaying search patterns on a sea map which can then be discussed in a text chat. This implementation shows that the application developer can concentrate on the design of application logic. The distribution of the collaboration subject can be integrated transparently by using the middleware. Furthermore, the applicability of the middleware is demonstrated by BMT as the middleware is already used in the current development version of the e-learning application.

Future features that should be integrated into the middleware are the possibility of saving a session state to pause a session and voice communication. For the persistency feature, a dedicated persistency client can be implemented. This client connects to the ROIA and receives the status of every Distributed Attribute created in the current session. This status is then written in a local database. When the session is restarted, the persistency client creates new Distributed Attributes according to the data in its database. Thus, the persisted state is active again. The voice communication feature can be added easily by the integration of RTF's Audio Framework Modules (AFM). The AFM provides real-time audio-communication among clients. ELAs would benefit from audio communication which would improve the users’ acceptance.
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Learning 2.0 in the Education Sector of Pakistan

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Introduction

Like Web 2.0, the recently coined term Learning 2.0 has various meanings. In this paper, we attempt to define and give examples for how Learning 2.0 is being piloted in Pakistan as a component to the “LINKS TO LEARNING: Education Support to Pakistan (ED-LINKS)” program funded by USAID.

Serendipity smiled on the ED-LINKS program with three factors for introducing Learning 2.0 in Pakistan, a country which has one of the highest illiteracy rates on the planet:

- A recently developed technology, with unique digital content generation capability and having interactive, collaborative features was being adopted for training and communications in the United States by major corporations. It was adapted for ED-LINKS as the Learning 2.0 Platform for Pakistan.
- Learning 2.0 requires Internet connectivity and fortunately Pakistan is blessed with the first national WiMAX broadband wireless infrastructure covering 22 cities.
- Political hegemony thrust Pakistan onto the political world stage and a chorus of global partners, supporting the newly elected democratic government as a strategy for regional stability, provided economic assistance for education.

The linkages of the above factors has the potential to position the ED-LINKS Learning 2.0 pilot program as an education showcase that can scale throughout Pakistan and become a model for other developing countries seeking education reform and youth training programs.

Learning 2.0

The latest evolution of the Internet, Web 2.0, has shifted attention from access to information toward access to others. Innovative online resources such as social networking sites, blogs, wikis, and virtual communities are challenging traditional methods for communicating and learning. A new user-centric information infrastructure is emerging that emphasizes participation over presentation and promises to lead to and support a rich ecology for the global adoption and validation of Learning 2.0.

Learning 2.0 is about reversed mentorship and transforming classrooms into these learning ecologies. It is also about making connections to content experts and using new interactive digital tools for scholarship. All participants, including students, can contribute in this new learning landscape as they seek a new syntax to describe 21st Century learning phenomena.

Learning 2.0 for Developing Countries

In the Millennium Declaration, United Nations Member States agreed upon a number of key development goals including making available "the benefits of new technologies--especially information and communication technologies". In 2001 the UN Information and communication Technologies Task Force was formed with the aim of bridging the
global digital divide, fostering digital opportunity and putting Information Communication Technologies (ICT) at the service of development for all. There is a classic debate for the introduction of Learning 2.0 in the developing world: what comes first--information technology or addressing citizens' basic needs? While addressing the most basic needs, such as building more classrooms and providing clean water, Learning 2.0 can become a solution. If education and capacity-building are critical steps for entering into the new global economy, Learning 2.0 should be considered a critical facet of basic development, a supportive and augmentation for capacity-building and a means to people's empowerment. Global learning and cultural exchange via Learning 2.0 can also unite and contribute to co-existence and world peace.

**Learning 2.0 for Pakistan**

ED-LINKS is a $90 million, five-year program launched in 2008 and funded by USAID. Its mission is to improve the quality and sustainability of teacher education and student performance in targeted geographical areas of Pakistan. With 672,940 teachers and 7,395,311 students within the secondary school system of Pakistan, technology offers a solution for reducing costs and reforming education. With the requisite infrastructure, only technology has the ability to “scale” for educating the rapidly growing population of 170 million Pakistanis. Consider the following language “in quotes” taken from a published USAID document: “In Pakistan, the cost of teacher professional development is 25.5 times the cost of training a secondary school student. Producing low-grade teachers at such a high cost is a matter of concern”. Rather than continuing to incur “High Per Capita Cost for Low Grade Teachers”, with the Learning 2.0 Platform technology, lectures from top Pakistani teachers can be recorded for distribution over the Internet resulting in a quality education for millions of students.

**Curriculum Reform**

The education situation in Pakistan is appalling:

- The overall literacy rate in Pakistan stands at 28%. For males, the literacy rate is 39%. For females, it is 25%.
- Pakistan ranks second among the countries of the world with highest number of out-of-school children, second only to Nigeria.
- Pakistan spends less than 2.5% of its GDP on education, a level well below the 5% minimum recommended by UNESCO.
- Despite the government's claim to fight illiteracy, 10 million children of primary school-going age are not enrolled in any educational institution.

More than 50% of children enrolled in schools drop out before they reach 5th grade.

The World Teachers’ Day held in October, 2008 produced draft recommendations to the Pakistan Ministry of Education. The draft is replete with recommendations for the “urgency” of adopting ICT as a low cost equalizer and for developing ICT/learning technology pilot projects and evaluating them thoroughly. It also recommends the need of educational networks and that the “Latest technology must be used for connectivity and training particularly in far flung areas.”

In November, 2008 the newly elected government announced that it was taking measures to introduce uniform curriculum by 2010 in all schools in Pakistan. A new national education policy is under preparation and the draft policy has been shared with the provincial governments and institutions concerned.

**Internet Connectivity**
WiMAX is a similar technology to Wi-Fi’s wireless transmission of digital data, but having a maximum bandwidth of 75 Mbps and a potential range of 31 miles far exceeding the 150 feet provided by Wi-Fi. It is a cost effective way to augment existing wire-line infrastructure and is rapidly being adopted across the globe.

**WiMAX for Education**

WiMAX technology offers the best promise of modern, high-speed communication and Internet access for developing countries. Subscribers can be businesses, residents, care-providers, and public safety officers, virtually anybody who needs voice and broadband connectivity. Moreover, it is ideal for showcasing how emerging market countries can leapfrog directly into next generation Learning 2.0 technologies.

For approximately $25 per month each school can have a wireless broadband connection to the Internet which is low price to pay for access to a global world of knowledge where traditional textbooks cannot compete.

**Wimax in Pakistan**

An ED-LINKS social networking group We Connect Schools in Pakistan proposes to connect 100 public schools that have computer labs to Wateen Telecom’s WiMAX infrastructure covering 22 cities in Pakistan. A successful pilot program could ultimately be expanded to all 25,000 public secondary schools; thus, opening a “Window into the World” for millions of Pakistani students and teachers.

**Learning 2.0 Technology**

The ED-LINKS Learning 2.0 Platform is a unique technology having the ability to live webcast and record presentations and events as “chapters” for simultaneous posting and subsequent viewing as video-on-demand. The software provides a wizard for the presenter to pre-segment the presentation into short digestible reusable learning objects which can be commented upon and annotated “tagged” in real time. Concurrent with the presentation or event, the software uploads the chaptered video onto a server. The presentations and lectures can be produced with an inexpensive webcam using any type of computer.
Enormous amounts of valuable programming can be inexpensively produced and archived into a searchable digital repository for subsequent “anyplace, anytime” learning. The custom built Flash video interface provides for the seamless integration of blogs, wikis and other interactive Web 2.0 features that dominate new media on the Internet. The ability to embed these features into the video enhances viewers’ interaction with the content and with other viewers. Blog entries allow the aggregation of informational content while also creating a community of interested parties. User-generated content can be organized by topic, relevance, and freshness, and provide a forum for posting content and comment for the intended audience.

When presenting to a virtual audience, collaboration and interactivity become critical components for learning. The technology has a unique polling feature allowing the instructor to push polls and questions to the students to gauge general comprehension, receive feedback, and test the effectiveness of the lecture. Combined with WiMAX connectivity to the Internet, with the Learning 2.0 Platform, enormous amounts of quality lectures and best classroom practices for Teacher Professional Development can produced, organized and managed. Furthermore, the Learning 2.0 Platform allows for both pre-existing and live video to be collaborated upon, re-purposed, re-edited, and dynamically altered without any additional hardware or software other than a common web browser.

Social Networks

To develop cordial relationships between the youth of Pakistan and the United States, and to share learning and teaching experiences the ED-LINKS Social Network was created to perpetuate the program beyond the two week 2008 Tech Camp in Virginia. Videos and photos on the social network reflect the fun, learning, and exciting cultural exchanges the Pakistani students experienced. Moreover, this network illustrates the social learning experiences and new ways of communicating that better serve the interests of 21st Century students.
The goal is to recruit 10,000 teachers and 100,000 students to join the ED-LINKS Social Network over the next four years to participate in next generation learning and communications. This is an ambitious, yet realistic goal when considering the target universe amounting to 672,940 teachers and 7,395,311 students in Pakistan’s secondary school system.

**User-generated Content**

A precept for Learning 2.0 is the production rather than consumption of content – user-generated content. On the Internet today, there are endless examples of the Web’s ability not just to serve up content, but to empower users to share their imaginations, insights and opinions. This fosters greater communications and understanding which adds to the world's knowledge and advocates for positive change.

**Teacher-generated Content**

An example of the presentation Learning 2.0 Platform format with its interactive and collaborative features can be viewed with the social studies lecture "About Pakistan" presented by Saadia Tasneem, a secondary school principal and educator from Islamabad who served as a chaperone at the 2008 Tech Camp.

**Student-generated Content**

Implemented and utilized correctly, Learning 2.0 tools can enable the student to also become a teacher, which is arguably the best way to learn. Furthermore, students have a greater affinity towards new technologies and are better serving as agents of change in an increasingly digital world.
The talented students from Pakistan who completed the 2008 summer Tech Camp in Virginia quickly learned the digital skills for how to videotape lectures and best classroom practices in their schools. Several students produced video lectures on how to use the Learning 2.0 technologies. The intent is that they will in turn teach their peers in Pakistan these skills and infect thousands with viral learning for rapidly scaling skills throughout the school system.
Conclusion
With the ED-LINKS Learning 2.0 Platform, teachers and students from Pakistan have a national education platform of user-generated content employing collaborative next generation Web 2.0 concepts and technologies. This Learning 2.0 project showcases how denizens from the developing world, employing next generation internet technologies, can become tech literate and compete in an increasingly “flat world” global economy.
References


New Technologies for Quality Learning in the Middle East:
Experience and Lessons Learnt

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Introduction

The fast expansion of new technologies changes production methods in industry as well as the delivery of services. In view of this, the EU Barcelona Process/Union for the Mediterranean embraces education and training as vital for the development of knowledge societies. According to Arab Human Development Report: Building a Knowledge Society, Arab countries face considerable challenges to becoming true knowledge societies. These challenges range from infrastructure issues, languages and cultural characteristics, to quality of education and training. According to the report, ICT needs to be integrated into education and training to address skills needs in a global market. In the wider context of education and training reforms re-shaping of skills and competencies of teachers and trainers is high on the agenda.

The regional MEDA ETE (Education and Training for Employment) and its project component on “eLearning for teachers and trainers in the MEDA region” focuses on developing methodological and pedagogical capacities to enable teachers and trainers not only to use new technologies in their everyday working environment but also to develop practical experience to make teaching and learning more flexible and closer to the trainees’ needs. It seeks to respond to the needs of a specific group and, at the same time, tries to reach the maximum level of sustainability and continuity of capacities and skills acquired.

Project approach

Although the idea in itself is not new, the key strong points of the project consist in having developed a distinctive course with the support of high level experts and the teacher training institutions of the MEDA countries concerned. Particularly, the institutions have cooperated in filling in the training needs analysis which served as a basis for the course design and for the development of the course curriculum, which touches, in a comprehensive way, the whole system of learning.

The course brings the teachers and trainers through the different stages of how to design, develop and deliver an online course with a strong emphasis on collaborative learning. Learning on the platform is combined with face-to-face meetings. The curriculum learning path encompasses all features linked to the creation of an eLearning course, from introductory modules on eLearning, to core modules on tutoring, pedagogy and technology to be complemented with all correlated aspects such as managerial, financial and logistical issues. This way, each trainee will have produced, at the end of the course, his/her own project drawing from personal experience and adaptable to his/her specific working context. He/she will also have experienced the difficulties and
challenges implied in putting together an eLearning course from different perspectives ranging from pedagogical to structural and technological issues. This way, learning becomes a comprehensive process which includes knowledge acquisition, knowledge sharing and the capacity to reapply and replicate it.

In concrete terms, and in order to guide the learner towards achievement of the learning objectives, each module provides the theory, along with a variety of practical examples in which the theory is applied. The learner’s achievements are finally assessed both on the factual knowledge acquired (through multiple choice tests) and on the learning outcomes through the combination of evaluation of the contribution to collaborative work and the production of a summary outcome (i.e. sample of training needs analysis, course storyboard, etc.). Through this approach, learners receive regular feedback on their results, to allow for re-engineering and fine-tuning. The learning process is supported by tutoring actions that support learners while creating trust and confidence in the new learning methods. In addition to providing direct support through the platform, teacher training institutions in the country are committed to providing support to and motivating trainees during course implementation.

Challenges and Corrective Measures

In the context of the challenges that have been brought forward during project implementation, specific grey areas can be identified. Key issues that emerged are related in particular to the methodological choice of the blended approach, the overall learning environment, the course language, the structural and technological frameworks and the balance between country and regional needs. These areas will be illustrated in the following paragraphs, specifying difficulties encountered and the type of solutions or corrective measures that have been put in place to overcome them.

Methodological Choice

It has been decided to adopt a blended learning approach for course delivery, combining multiple approaches to learning with particular reference to technology-based materials and face to face sessions. “Blended Learning is learning that is facilitated by the effective combination of different modes of delivery, models of teaching and styles of learning, and founded on transparent communication amongst all parties involved within a course”. The idea at the project’s start was to focus on online training (through the online platform) interspersed with face to face meetings with the trainees in the countries and regional events. During course delivery, however, it became clear that trainees demanded more face to face meetings and stronger online tutorial support. In particular, it became evident that during the course start-ups in the beneficiary countries, participants showed commitment and enthusiasm, with peaks of online presence for a few days afterwards. But participation dropped consistently and continuously afterwards and this had an impact on course delivery, causing delays in the opening and closure of modules.

As is often pointed out by teacher training institutions, and as is often the case in e-learning, it is difficult to sustain the motivation of trainees, avoid dropouts and promote ‘drop-ins’. With the aim of overcoming this difficulty, it country-specific virtual meetings were organised to gain a better understanding of the major difficulties from trainees, to provide them with ad hoc support and to motivate them for the phases to come. In addition, additional face to face meetings in the countries took place. Along with these ad hoc activities, online tutoring support has been reviewed and a revised plan
for tutoring actions has been put into place to strengthen regular support to trainees. Teacher training institutions in the countries have collaborated by providing continuous support through monitoring of trainees’ progress and organisation of specific training sessions. These measures have allowed to successfully concluding the course with around 100 out of 150 trainees eligible for the final certificate.

The Socio-Constructivist Approach and Collaborative Learning

The socio-constructivist approach to learning is less familiar to MEDA teachers and trainers who are more familiar with traditional didactical methods. Further complications are linked to the use of online tools and the introduction of new didactical, pedagogical and technological concepts that are still being pioneered in most of the countries. Experience shows that teachers have difficulties in accepting and understanding new learning and teaching processes and contexts. In fact, they are still acting in environments where traditional ways of teaching and learning are still widely preferred. As a collaborative tool for improving the quality of teaching and learning, e-learning is a rather new concept for the institutions and trainees, which would prefer to put more emphasis on face to face discussions and less on learning through the online platform, which in itself represents a new learning environment. This issue has been addressed by motivating trainees to exploit as much as possible the potential for using the platform as a collaborative tool. Groups established in different countries have been tasked with achieving certain outcomes and have been engaged in a process-oriented task, the objective of which has been to work effectively in a group or team inside national communities and/or in the regional community.

Learning Resources and Case Studies

With regard to learning resources provided and their relevance for vocational education and training, it has proven difficult to provide relevant best practices in the field of vocational training. In part this has been accommodated by asking participants to provide examples from their own experience, and through the collection of national practices. But in order to support the trainees in re-applying the knowledge acquired in their school environment, further cases from the technical vocational education and training sector need to be made available. An inventory of cases of practice has been developed. The idea is to provide the network with a repository of practice and learning materials to be consulted and shared among countries in the region.

The Project Platform

The learning platform on which participants have worked is an open-source one (Moodle), which has been widely used in recent years at the international level. While experience shows that the selected platform is flexible, easy to use and adaptable to different contents, its potential as a collaborative learning environment and pedagogical tool needs to be better exploited for the benefit of the trainees. In the project, the platform has been primarily used rather for digital distribution of content and as a digital library of resources and references rather than as a dynamic space for collaboration. Trainees, who also have experienced occasional problems in navigating the platform and finding their way through the different fora, have been supported, and further awareness has been raised to help them make the best use of the platform as an environment for collaborative learning.

In addition, the project pedagogical team has increased guidance of the trainees through the learning process, with particular attention to the learning resources and the overall pedagogical pathway proposed. Opportunities
for collaborative learning were increased so that participants could share and learn from one another. Through a focus on the learner and on the learner’s needs and pedagogical requirements, there has been an increase in awareness of the overall learning process, leading to a final quality learning outcome. The assessment tool that has been applied was a mixture of multiple choice tests and an assessment of learning outcomes. While this allowed regular monitoring of participants’ results, analysis suggests that there is a need to further accommodate a formative assessment approach in order to improve the regulation of the learning process and in general to improve the quality of learning outcomes.

**Language Barriers**

Another challenge is the language barrier. As agreed during the project design phase, the course has been delivered in French, mainly for the Maghreb region, and in English for all other participating countries. This choice, linked to the need to find a language that is common to the majority of the project members and countries involved, has given rise to some challenges in two different directions: availability of resources for French-speaking participants and improved language skills for English-speaking participants.

For the Maghreb region, availability for the participants of relevant learning resources and references in French represents a problem. Because e-learning has its roots in the Anglo-Saxon world, it is often difficult to find appropriate resources and terminology in French. Effort has been put into addressing this challenge, in particular through the help and suggestions of trainees and by taking advantage of French-speaking experts working in the project.

In the case of English, although knowledge of English was one of the selection criteria set for the target group of trainees, in reality in some countries the level of English of the trainees was not sufficient to allow them to follow the course appropriately and understand the learning content. Some countries have tried to catch up by organising language courses in parallel. The localisation of the course should ensure a better accessibility. The Arabic translation of the course outline is already available to Arab-speaking countries.

**e-Readiness of Countries**

While the training needs analysis investigated individual needs, it looked at a lesser extent into the e-readiness of the countries’ education and training systems, particularly into existing structural conditions allowing the development of e-learning. In most countries, the integration of new technologies in education and training is supported by strategic frameworks (integrated into laws, policies, special plans, e-strategies, etc.). Recent findings show that implementation is moving slowly and concerns mainly general secondary and higher education. Examples can take different forms. In some cases, they take the form of public-private partnership between education and training authorities and private companies, as in the education initiatives in Jordan and Egypt (http://www.weforum.org/en/initiatives). In other cases, advantage is taken of international certifications such as that offered by the International Computer Driving License (ICDL), delivered in various countries to provide information technology (IT) literacy skills at various levels. Regarding technology and infrastructure, many challenges have been faced or are being faced at the country level, including lack of, or obsolete, infrastructure; high telecommunications costs; poor quality of telecommunications; a low rate of access to Internet; poor digital literacy; and the digital divide. All these aspects, which are present at different levels in all the countries throughout
the MEDA region, have had an impact on course delivery. In particular, the majority of trainees do not possess a PC at home and this means that they have to rely on resources at their disposal in their institutions or in Internet cafes. This has introduced additional difficulties and creates real technological barriers.

Although the project itself does not wish to put the focus on technology but on methodology, and despite the growing interest and demands for e-learning in the countries, the existing technological and infrastructural barriers still represent a major challenge. This makes the further integration of e-learning a second priority in the overall process of education and training reforms.

**Regional and National Dimensions**

The project has been designed as a regional project, fostering the exchange of experiences and mutual trust while taking individual country needs on board. In this context, the national teams have been central to the project. The teams are composed of a project coordinator, a pedagogue and/or an IT specialist. In addition to providing country-specific support, they represent the community of practice that shares knowledge and experience at the regional level and provides comments and feedback for key project documents and outputs. However, this type of regional exchange has taken place mainly during the bi-annual regional seminars and, to a much lesser extent through the project platform. There are some examples of initiatives for bilateral cooperation in sharing examples of good practice, such as cooperation between Israel and Turkey.

While regular cooperation at the regional level needs to be improved, cooperation and exchange inside the country is working quite well. This is in particular the result of the coordination and support of the country project teams during course deployment. Support provided to the trainees takes different forms, mainly through organising regular face to face meetings in the countries, promoting collaborative work within the trainees’ community and encouraging group work for the preparation of the outcomes of modules.
Conclusion

In the light of the assessment, the following recommendations should help sustain participants’ motivation and allow a substantial number of trainees to complete an eLearning course. As indicated above, low motivation, high dropout rates and discontinuous participation represent common challenges in any online course. Ways and modalities to avoid dropouts are continuously under discussion, and they are changing. There is no unique solution. But experiences show that a sound tutoring approach is pivotal in guiding trainees and building trust and confidence in new ways of learning.

Particular focus needs to be put on regular face to face meetings, possibly with the support and commitment of the teacher training institutions and local tutors, to allow for exchanges among trainees and to stimulate group work.

Module by module, awareness for better deployment of the portal as a learning environment rather than as a simple static tool should be increased. While guiding the trainees along the learning path to the final learning outcome, it will be important to increase awareness of the pedagogical approach applied and to ensure a shared understanding. Particular emphasis should be placed on providing further examples from the field to facilitate learning applied to realities closer to the trainees’ working environments. To complete the picture, training modules should also concentrate on the importance of the ecosystem approach for e-learning, including legal and/or policy frameworks, financial resources, and awareness raising at the institutional level to allow trainees to have full support both from the institution as well as in the home context.

For future sustainability at the institutional level, e-learning should be promoted and supported in order to be integrated progressively into the teacher training system. Regional cooperation should focus specifically on sharing experiences and lessons learned, with the aim of learning from each other while focusing on collaborative work and examples of good practice.

As far as cooperation at national level is concerned, it will need specific exchanges with major stakeholders in a country to prepare for integration into the education and training system. It is encouraging that some countries have already undertaken first steps in this direction.
References


**Abstract**

No doubt, e-learning improves the quality of the learning experience for the students, but at the same time it poses many challenges for students, academic faculty and the institutions providing the education. The strong interest in improving education has led to introducing e-learning management systems, raising awareness on e-learning benefits and increasing in funding for e-learning technologies. The objective of this study is to identify these challenges and suggest solutions, which may help in easing the transition from traditional teaching to e-learning teaching. Choosing the appropriate Learning Management System (LMS) and teaching using a LMS poses the main challenge for academic faculty and providing the skills needed for both faculty and students is the first step in raising awareness on e-learning and its importance. This study investigated the preparedness of faculty for the introduction of e-learning in Middle East emerging colleges and universities in general. As a case study a questionnaire survey was distributed to academic faculty members of different departments and the initial findings revealed that e-learning training and e-learning confidence are the main predictors of both e-learning adoption and e-learning readiness. The study was also supported by using a phenomenological approach with semi-structured interviews carried out with some administrative and academic faculty in order to clarify and support some of the findings in this study. The initial findings of the study showed that e-learning in the Middle East is in its infancy stages compared to other countries. To reach the level of education provided by developed countries numerous work is needed to accelerate the e-learning transition process. All participants involved in the study expressed their willingness to gain the required skills needed to achieve the goals for providing state of the art teaching and are demanding more from the institutions in raising the awareness, providing incentives for faculty and increasing the funding for e-learning to cope with the rapid changes in e-learning technology in the 21st century.

**Introduction**

E-learning has gained significant popularity in developed countries since the early 2000s. The term e-learning refers to any electronically assisted instruction, but is most often associated with instruction offered via computers and the Internet. E-learning is a learning concept that is supported by the use of digital tools and content, which usually involves interactivity between the learner and their teacher or peers. Any learning that
utilizes a network (LAN, WAN or Internet) for delivery, interaction, or facilitation also comes under the definition of e-learning. E-learning encompasses all learning undertaken, whether formal or informal, through electronic delivery (Oblinger & Oblinger, 2005).

The significance of e-learning is that all students and teachers will have access to information technology in their classrooms, schools, colleges, universities, communities and homes. All teachers will use technology effectively to help students achieve high academic standards to compete with the challenges of the 21st century. The transformation of teaching and learning can be achieved through digital content and networked applications. This will provide the students the technology and information literacy skills to improve their research, evaluation and learning capabilities (Institute for Interactive Technologies, 2006; Assumption University 2002).

E-learning has many advantages over traditional learning such as strategic, tactical, training delivery and infrastructure. E-learning training is a powerful instrument for developing a global labor force. E-learning training can deliver custom, sophisticated instruction to employees worldwide. The use of e-learning management systems allows organizations training functions to keep pace with the market. Learners can access courses and content from their homes, colleges, universities or any point around the globe. E-learning training is delivered uniformly in a consistent framework, which increases understanding and absorption of the material. E-learning training makes use of already existing infrastructure such as computers, servers, and intranets (SyberWorks, 2004; Choy, S. 2007).

E-learning entails numerous challenges and limitations, including; up-front investment, technology upgrades, cultural acceptance, and reduced social and cultural interaction. Up-front investment required from an e-learning solution is larger due to development costs. Technology plays a factor whether the existing technology infrastructure can accomplish the learning and training goals or must be upgraded. Cultural acceptance is another issue in organizations where student demographics and psychographics may predispose them against using computers at all, let alone for e-learning. Technology issues of the learners are most commonly technophobia and unavailability of required technologies. Another drawback of e-learning is the reduction of social and cultural interaction. The impersonality, suppression of communication mechanisms, such as body language, and elimination of peer-to-peer learning that are part of this potential disadvantage are decreasing with advances in communications technologies. “The pro's and con's of e-learning vary depending on the program goals, target audience, organizational infrastructure and culture. But it is unarguable that e-learning is rapidly growing as a form of training delivery and most are finding that the clear benefits to e-learning will guarantee it a role in their overall learning strategy” (e-Learning Guru, 2008; Aydin, C. H., & Tasci, D., 2005).

In (SyberWorks, 2004; Webb M. 2008), a case study presented an example explaining the Return-On-Investment (ROI) of e-learning under conservative assumptions. It was found that e-learning saves approximately 20% in the first year of implementation and in later years when development costs are not a factor the savings for e-learning grows to nearly 50%. When e-learning is properly implemented, the ROI for e-learning can be 50%-60% greater than traditional training, (Semen A. 2005).

**E-Learning in the Middle East**

Dr Bassem Khafagi from Nahda University, Egypt, one of the leading education experts and chair of the Middle East E-Learning
Forum & Exchange at ONLINE EDUCA BERLIN states that, “The average money spent on education in the Middle Eastern countries is considerably higher than the international average. There is a strong interest in education, motivated by large-scale changes both within the national and the global economic systems.” This coincides with figures recently published by the Madar Research Group, UAE, which states that the United Arab Emirates have one of the highest rates of admission to higher education, with 90% of secondary school graduates entering college or university. Open-mindedness towards education goes along with an enormous growth of the ICT market in many Arabian countries. Though some are still facing problems in Internet and broadband supply, online access rates are growing constantly, thus setting the stage for e-learning deployment on a large scale. According to (KleeBenm, B. 2004), Saudi Arabia’s e-learning market is expected to grow from 10% in 2004 to 32% by the end of 2008.

The Middle East is an emerging market as experts suggest today, even though major western e-learning and I.T. suppliers expanded their boundaries into the Middle East many years ago. Microsoft, for example, opened its first Middle East office in 1991 and today has five subsidiaries in the region. Microsoft started the largest e-learning project in the Middle East at Sana'a University in Yemen by deploying a Learning Gateway Solution, an advanced e-learning platform. This Learning Gateway Solution will connect the students with a powerful integrated learning environment that includes course content, online examinations and course work submission, communication and collaboration tools. Another key player in the field of e-learning, WebCT, has over 45 customers in the Middle East. One of them is MTC Vodafone in Bahrain who recently founded an e-learning center located in University of Bahrain (Semenov A. 2005; O’Neill, K, 2004).

Methodology
A semi-structured survey was conducted using a sample of 231 participants of faculty members from different Middle Eastern colleges to discover the prevalence of e-learning. The study was also supported by phenomenological approach, which allows participants to express their feelings freely and openly. Thirteen interviews were conducted one-to-one and by telephone to support this process. Before the survey was distributed to a sample of participants, it was piloted on fifteen participants and five interviews were conducted one-to-one and by telephone. The participants were asked to comment on the clarity of the survey, following their recommendations and after an in-depth literature review, a semi-structured survey was designed as a tool for data collection. The type of questions were True/False, multiple choice, short answer questions and open answer questions where the participants have to express their views on certain e-learning aspects. The participants were also encouraged to give any comments they feel are relevant to the study. The phenomenological approach with semi-structured interviews was carried out in order to consolidate some of the findings that were observed from the surveys. The analysis and evaluation are discussed in the next section.

Analysis and Evaluation
The study reported that all participants have post graduate qualifications and in turn their ICT skills are above average. It also shows that the awareness in using e-learning tools is below average as compared to developed countries, this is mainly due to poor communication in advertising for e-learning workshops and training events. 80% of the participants reported that they heard about these events through the word of mouth.
Therefore, the awareness of e-learning workshops and training events starts with improving communication through the proper utilization of existing communication infrastructure such as, advertisement boards, university magazine, SMS, emails, and internal mail. Even though workshops are conducted in some institutions but the timings conflict with the schedules of most of the faculty members. Suggestions from the participants are to conduct the workshops and training events in the evenings or weekends with appropriate incentives or to conduct these events at departmental levels. The study highlighted the dissatisfaction of participants with the workshops they attended, with 65% of participants reporting that they did not gain the required knowledge during the training sessions, since the trainers were not fully-trained to deliver the content. The participants suggested that the local lecturers and professors should be fully trained to train the other faculty members.

Most of the participants involved in the study expressed their willingness to gain the required skills needed to achieve the goals of providing state of the art teaching and are demanding more from the institutions in raising the awareness, providing incentives for faculty and increasing the funding for e-learning to cope with the rapid changes in e-learning technology in the 21st century. A number of institutions in the Middle East are still facing problems in Internet and broadband distribution. Online access rates are growing constantly, thus setting the stage for e-learning deployment on a large scale. Therefore, raising awareness and preparedness of institutions and faculty members are the key issues in the successful deployment of e-learning systems.

The future of e-learning in the Middle East is moving toward increasing virtualization, not just in terms of teaching and learning, but also in other areas such as online library resources, students and faculty services. By bringing more trained individuals into the online environment, e-learning will help students and faculty gain an enormous level of information literacy. The goal is to put the personnel, hardware and software in place to support anytime, anywhere access to information, resources, tools and services. The recommended technical initiatives include:

- Enhancements to the current computer network infrastructure, including hardware and software.
- Installation of ubiquitous wireless networks to provide remote Internet connectivity.
- The support of mobile e-learning.
- Provide training through the information technology centers of the institutions for faculty and students.
Conclusion

E-learning has a profound significance in Higher Education for improving the learning experience for students. However, the necessary transition from traditional teaching methods to the benefits associated with e-learning entails a number of challenges and limitations that must be addressed. In conclusion, the study found that the strong interest in improving education has led to raising awareness on e-learning and increasing in funding for e-learning technologies. Higher ROI can be achieved if the transition from traditional teaching to e-learning is implemented properly. Raising e-learning awareness, providing incentives for faculty, and increasing the funding for e-learning will assist with the challenges of implementing e-learning systems for the 21st century.
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Web 2.0 Learning Designs for Communities of Practice in Management Education

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Abstract
This paper will explore some of the challenges faced by a learning organisation looking to deploy web 2.0 to support formal and informal learning, particularly among Professional candidates that may be remote from the campus, geographically dispersed or pursue their studies in the workplace.

We will examine a case in which a web 2.0 social learning platform, built to support a workbased learner population of Professionals that may spend weeks or months away from the University campus, has responded to an issue of low levels of engagement and participation.

The experiences are informing policies and best practice guidelines for the wider University. On a practical level the study discovered that a mix of tools, incorporating older communications technologies (email and SMS) into the web 2.0 learning platform, thus lowering technological barriers to participation led to improved student engagement and a stronger sense of community, allowing space for a constructivist pedagogical approach to be tested.

The paper concludes that while Web 2.0 technologies offer a substantial development in distance elearning we should not dismiss accepted, trusted and simple technologies at the same time, but embrace them as a cost-effective means of encouraging participation in online communities of learning.

Introduction
Middlesex University’s Institute for Work Based Learning (WBL) has been operating for over ten years at the time of this writing. Its original distance learning design was a paper-based correspondence model. This relied heavily on the content in the handbooks and one-to-one (1-2-1) tutorial support from WBL Learning Development Tutors predominantly through email and phone feedback. Over the past five years there has been a steady transition into the use of a commercial virtual learning environment (VLE) in the form of Blackboard/WebCT. At first this system matched the WBL teaching and learning design since there was a strong reliance on the course handbook for information and guidance. However, as student numbers increased the student-teacher ratio meant this model was not sustainable for the future. The 1-2-1 pedagogic model would need to expand into a triad that would promote and support peer involvement. Students were growing in their ICT confidence and capability with the increased use of Web 2.0 social network systems such as Facebook (2008) and YouTube (2008).
This was evidenced by student representatives at the WBL Board of Studies sighting the need to continue to improve the VLE for the future (BOS 2007). Cohorts of WBL candidates identified the need for a shift from a content-driven eLearning system to one which could support the type of peer review that WBL was growing into. The WBL programme structure has three main stages. First, students construct a portfolio of their prior professional knowledge. This Recognition of Accredited learning (RAL or a.k.a. Accreditation of Prior Experiential Learning (APEL)) stage benefited by candidates sharing professional experiences in constructing their areas of learning claims (Armsby et al 2006). Next, WBL students would formulate an individual learning agreement that would guide the construction of the degree programme based on how much Higher Education (HE) credit was attained in the RAL stage. In conjunction with this activity they would learn about method of conducting research in the workplace which would prepare them for the final stage of the degree. Lastly, research projects would be carried out in the workplace to amass enough credit to complete the programme. The nature of this learner-managed-learning approach to WBL meant that as the candidate progressed through the programme peer support became increasingly beneficial (Stephenson 2007).

A new style of VLE was needed to meet the evolving requirements of these professional practitioner researchers. It was at a conference at University College London (2006) that a dialogue opened between the MU-WBL group and the Emerald Publishing InTouch contingent.

**Elgg Social Network System**

Emerald Publishing has been accustomed to the issues and challenges of working with global, diverse, and geographically dispersed communities of academics, researchers and editors for many years. As such we are always looking at ways in which we can support our communities more efficiently and creatively. In 2006, as the web morphed into Web 2.0 and again into Social Media tools we began to explore how these technologies might impact our journal communities and how best to prepare for such change.

Though not directly involved in the delivery of learning materials or the nurturing of specific communities of practice, in many important ways an Emerald Journal, with its Editors, publisher at the HQ, teams of reviewers and of course the academic authors who contribute the papers and the researchers who consume the content, form a real and substantial Community of Practice. They are characterized by "a shared domain of interest" where "members interact and learn together" and "develop a shared repertoire of resources.", Wegner (2001).

Wenger (2001) describes a community of practice as groups of people who share a concern or a passion for something they do and learn how to do it better as they interact regularly. This also happens to form the very essence of the scholarly communications process and ethos which involves a range of closely-linked activities that contribute to fulfilling these broad purposes or objectives which flow roughly in sequence:

- The pursuit of research aimed at generating new knowledge and understanding,
- Assuring the quality of the information outputs generated by researchers,
- Ensuring appropriate recognition and reward for all those engaged in the scholarly communications process,
- Presenting, publishing and disseminating information outputs digitally, orally, in print and other forms,
- Facilitating access to and use of information outputs by researchers
and others who have an interest in them,

- Assessing and evaluating the usage and impact of information outputs,
- Preserving digital, printed and other information outputs, so that those of long-term value are accessible for the indefinite future.

Both the purposes and the activities to support them overlap, and information outputs come in many different forms, disseminated through both formal publications and more informal mechanisms. Moreover, the roles and responsibilities of the actors in scholarly communication – researchers, funding agencies, publishers, librarians and others – are changing under the stimulus of new technologies, and the growth of new mechanisms for communicating the results of research. Nevertheless, the purposes set out above provide a framework for developing a better understanding of the scholarly communications process.

It was with these broad objectives in mind, coupled with an awareness of the possibility of emerging read/write web tools and a desire to foster real communities of learning and practice among our journals communities, that Emerald developed the InTouch platform in 2007.

**Web 1.0 Learning to Web 2.0 Learning**

Downes (2006) sees the emergence of the read/write web (or Web 2.0 as it is more commonly referred) as a vision of the web. This direction is far more closely aligned to Tim Berners-Lee (2001) original vision for the web as a space for the production and co-creation of content from many users rather than the publish by a few and read by many model. It is allowing for the possibility of multimodal and asynchronous forms of content delivery, dialogue and the development of online communities of practice and learning that simply was not possible except in a very crude form until quite recently.

Downes (2006) also goes to discuss "community" in online learning “has been artificial and often contrived "discussions" supported by learning management systems, rarely approaching Wenger's (2001) theory”.

Downes (2006), also suggests that teaching at distance, and online, has not moved on since the term elearning was coined by Jay Cross in 1998 (Cross, 1998). “Traditional theories of distance learning, such as Moore’s (1991 & 93) transactional distance, have been adapted for the online world. In this model the online platform is regarded as a new vehicle for the transmission of pre-digested and formal information, the ‘old wine in new bottles’ syndrome.”, Downes 2006.

However, what happens when online learning ceases to be like a medium, and becomes more like a platform? What happens when online learning software ceases to be a type of content-consumption tool, where learning is "delivered," and becomes more like a content-authoring tool, where learning is created and published by anyone, much like the vision for web as originally described by Berners-Lee (2001)?

The established model of e-learning as being a type of content, produced by the tutors, and organised by the institution into courses, and eventually consumed by students, is called into question. The content is used rather than read — and is, in any case, more likely to be produced by students than courseware authors. And insofar as there is structure, it is more likely to resemble a language or a conversation rather than a book or a manual.

The e-learning application, therefore, begins to look very much like a Blogging tool. It represents one node in a web of content, connected to other nodes and content creation services used by other students. It becomes, not an institutional or corporate application, but a personal learning centre, where content
is reused and remixed according to the student's own needs and interests. It becomes, indeed, not a single application, but a collection of interoperating applications—an environment rather than a system. “It might look like the Elgg open source platform for learning communities.” Downes (2006).

Our Elgg platform, Emerald InTouch

Emerald InTouch is based upon the Elgg Open Source software platform for learning and community building. Elgg provides each user with their own web log, file repository (with pod casting capabilities), an online profile and an RSS reader. Additionally, all of a user's content can be tagged with keywords - so they can connect with other users with similar interests and create their own personal learning network. However, where Elgg differs from a regular web log or a commercial social network (such as MySpace) is the degree of control each user is given over who can access their content. Each profile item, blog post, or uploaded file can be assigned its own access restrictions - from fully public, to only readable by a particular group or individual.

Elgg focuses on the learner and interactions whereas virtual learning environments (VLEs) focus on the course and content delivery. It's about providing an informal space that lets learners exercise their own thoughts, reflections, make their own connections and be able to compile a body of evidence that would normally slip through the cracks with the more highly structured approach that a VLE offers. The creation of ad-hoc communities around similar interests is what happens when you learn and discuss in real life, and Elgg allows people to do this in the online space, whereas VLEs do not.

The Emerald version of Elgg has been extended and re-designed in part to accommodate the particular requirements of a journals publisher in the first instance. It has also been customised to meet the needs of those online learners who have chosen to have their learning community site hosted by us.

Industry and HE collaboration

Emerald are primarily publishers of research materials with a specialisation in Management and Business; Emerald is not directly involved in the delivery of courses, their design and their management. It is not our business and it is not where our expertise lies. We are however fortunate in being able to reach out across business and academia to form collaborative partnerships in order to achieve mutually beneficial goals. Emerald Group Publishing and the Middlesex Institute for Work Based Learning is an example of this kind of cross-sector collaboration.

The partnership has been in place since December 2006 with the aim of developing a joint capability in the both the technology and the pedagogy of online and social media tools for learning, particularly work-based and distance learning.

It was very important for Emerald to understand the psychological, pedagogical and social barriers to engagement on such platforms since our pool of subjects was, at the time, limited to our internal workforce.

MU approached Emerald after representatives met serendipitously at a learning event, this was followed up with video conferences and the recognition that we were in a position to help each other develop a capability and understanding of web 2.0 tools for learning networks.

The Memorandum of Understanding, which was signed, in May 2007 has provided the framework within which Emerald and MU have been able to collaborate on case studies, co-author a number of research papers and make bids for grants to understand further the implications and possibilities of this social approach to learning.
Both parties are now looking forward to the second full year of the MU pilot programmes. The first year is currently under review and the experience is to be independently audited and evaluated; this evaluation will feed directly into the nature of induction, support and development priorities for the platform and we look forward to it with interest.

The evaluation study is keenly awaited, although development of the site and its features are not dependent upon it. Emerald has partnered with other organisations too and the experiences and insights gained from those relationships are having an immediate impact on the platform. InTouch version 2.0 has been recently launched and includes many new services to encourage greater participation and engagement. Obstacles to content contribution have been removed and we believe that these developments will be positively received for students enrolling on the MU pilot programmes for InTouch.

**Case Study 1: Work Based Learning BA**

The following case study explores the use of Emerald InTouch (2008) social network environment where Alan Durrant shared his experience and learning as the programme tutor, “… I thought about how to use Web 2.0 technology as part of my teaching (and) considered the requirements of learners coming onto the Professional Practice BA Hons. programme. The course is for professional performing arts students (i.e. dancers, musicians or actors) where training has been very hands-on and directed. I wanted to give these students a higher education experience counter to this approach, where they would have to take much more autonomous control over their programme of study. The pedagogical underpinning of this method is reflective, self-directed learning. I wanted to help students develop their career management, critical and reflective skills in order to pursue their career more effectively.”

The biggest challenge for the pilot study was that of adoption. Although it was one of the course requirements to use Emerald InTouch, there were mixed levels of usage. Some students regularly posted blogs and updated their profiles, whereas others did not log-on since the induction sessions. Durrant said he “adopted an approach of strong encouragement”.

As he points out, “there are always going to be questions about how a system like InTouch fits into an academic programme. My feeling is that students are often busy people who may not taketime to reflect and will simply do what they need to do to complete the course. So if we want to develop them as reflective practitioners then we have to create situations where they are forced to reflect.”

One of the ways to do this would be by replacing assignments with assessment of the effectiveness of a students’ contribution to the collective discussions on the blog or the wiki. “This approach may be something we consider at Middlesex, but at present we are starting by creating situations where students must record reflections via InTouch without the assessment imperative. At the start of the course this was very tutor driven but we are now seeing more peer-to-peer interaction as compared with a lot of e-learning systems. InTouch is very intuitive. However, like any system, you need to use it often enough to feel confident on it. We have found that the students that did not attend the induction session took a long time to understand InTouch. Next year it will be essential for students to attend the (face-to-face or online) induction where we will carry out a more in-depth introduction to this platform”.

As well as student usage, it has also been important to ensure that there are protocols in place for the tutors. Durrant acknowledges that he also had to do some work to ensure complete familiarity with the platform and also to regularly check InTouch for comments and new blog posts as, he asserted, “There
was nothing more demoralising than posting a comment and your tutor does not respond to because they have long since stopped checking the site.” In response the Emerald technical team have added an email and SMS ‘alert tool’ to notify the learner when content is added to their communities. A functionality of the platform was the profiling tool which connected students through shared interests, research areas, courses or via a simple keyword search. According to Durrant, “(this) tool was extremely helpful because students would be coming onto the programme largely, if not completely working at a distance. Keyword linking made instant connections between people with the same interests, a great icebreaker.” Campus based induction focused on the profiling tool to allow students to become familiar with the system. Many of the students were already using social software such as Facebook and were more comfortable about uploading information about themselves rather than starting off with some sort of course-related or professional blog. An illustration of the success behind the pedagogic design of the system to develop an online community was demonstrated by one of the distant (off-campus) German students inviting a UK colleague to visit over the Christmas holiday. This comradery was fostered through the InTouch online social system design.

Case study 2 : Work Based Learning Professional Doctorate

Professional doctorate candidates vary from the average PhD candidate or indeed those in case study 1 by virtue of their age (mean age =45) and their level of professional responsibility. This means that they are probably not firmly imbedded in the web generation and perceive on-line tools as add-ons rather than a general feature of life and work. Also, their time is perceived by them (and others) to be precious and the time required to use such systems is a big consideration for them. They question: will it add sufficient value to my study/professional development? Candidates on the generic Doctorate in Professional Studies (DProf) come from the full range of professional areas from the IT consultant to the psychotherapist and therefore vary significantly in their level of knowledge, experience and understanding of ICT. For these reasons it was thought necessary to introduce the network in a carefully staged way and encourage users by providing an incentive. Incentivisation can work in a variety of ways and unlike case study 2 it was felt inappropriate, by virtue of candidates status and the programme ethos to make contribution a compulsory or assessed part of the programme. Professionals working at doctoral level would be accustomed to accessing appropriate communities of practice to make their work based developments. Thus if the network could provide a useful community to enable scholarly communication, it was judged that it would start with interested parties and gradually gain momentum through a kind of snowball effect. The opportunity to network with other high level professionals and the knowledge shared and generated in this forum was felt to be a good incentive, but there was a need to start the process in a positive way to immediately illustrate the positive benefits. Previous experience suggested that where possible face to face inductions gave candidates the confidence to use on-line facilities. Thus we decided to begin our snowball effect with an induction with two groups:

- The small percentage of our internationally located candidates that were able to attend the London programme induction (n=6).
- 2. a small group of DProf alumni and current candidates who visited the campus for a meeting to discuss ways
in which the Institute could facilitate an alumni and current candidate network (n= 11).
Both groups included people with a range of understanding of ICT but there was general consensus that the tools provided would be useful for supporting communications, especially during the long period of project work. Also, that the platform provided useful tools for continued usage after graduation. However, it was very firmly suggested that the advantages and purposes needed to be given clarity. This result reinforced our view that DProf users were likely to need initial guidance and focus.
These initial induction results were heartening especially given that this stage was difficult for several reasons:
- Several candidates in group 1 could not access the university computers as there were difficulties with their enrolment
- There was not time to allow hand on induction in group 2 so an induction presentation was given.
- Some staff (n=5) involved in the pilot were less experienced in using the network than others

The second planned stage was to enable the pilot candidate and staff group to explore the network facilities and feedback on functionality and suggested usages. To date the feedback has suggested that the profiling tool discussed in case study 1 is useful, an impetus to motivate usage is required, induction materials should be made easily accessible and the network is easy to administrate.
We are currently moving into the next planned stage in which we launch the network with the whole group of current and previous candidates (N= 300). Progress to this stage has been slow primarily because staff need to be confident in working with the network so that they can be sure to provide an initial positive launch experience and support the proceeding developments appropriately. Our experience to date suggests that careful support in the initial stages will encourage future confident usage.
Conclusion
Like any pilot study barriers were encountered along the way. The first obstacle was to forge an association agreement between the organisations that would meet not only teaching and learning agendas, but technical and political concerns as well. From a technical perspective it was necessary to work with the InTouch Elgg server outside of the university firewall system. This became a control issue with respect to security. The InTouch system was quite robust but the ‘corporate desk-top control’ ethos had to be addressed. To appease this links to the Elgg server were added to the home page of the IWBL programme VLE.

We had several positive experiences of the pilot study:

- Access to the system was easy. This was, in part, due to the fact that we did not have the student accounts linked directly to the university student data base for enrolment. For the pilot we had to add accounts manually.
- Staff and student inductions were positive and community building. A detailed evaluation of the stakeholders’ experiences is being conducted. This will provide qualitative and quantitative evidence of the systems learning value. Informal interviews of participants yield enough feedback to warrant a second follow-up investigation.
- Social bonding at a personal level occurred. Some of the BA students developed an online rapport that extended to their activity outside of the course. They met each other during the term break at informal social events

Some guidelines for use of our ‘professional social network’ that have begun to emerge from this study are:

- Inductions should be community building exercises to develop strong peer bonds. Traditional training approaches may not be enough.
- Both staff and students need to be confident and capable of using the system.
- Flexibility in the pedagogic design is needed to adapt the use of the many Web 2.0 tools appropriately to match the needs of the stakeholders.
- Evaluation should be part of the learning model at every stage of the pilot. This may be both formal and informal.

Practice of using the system will evolve over time so that eLearning pedagogic design principles can emerge. Some suggestions thus far concern:

- The public / private nature of the environment should be addressed. Every student may not want to have comments public at all times. An agreed protocol is needed to address various levels of access to postings:
  - Private postings (i.e. personal learning journals)
  - Peer-review (e.g. comments between two students) or tutor feedback
  - Small group community (e.g. getting a collaborative Wiki edited)
  - Open access (e.g. blog to the Internet)
- Active participation should be encouraged, but not teacher-led. Various approaches can be taken to promote student postings:
  - Award marks for a required minimum amount of critical friend comments posted publicly to the community,
  - In smaller groups take turns at moderating the discussion topic. This may be in the form of leading the...
discussion or summarising the discussion thread.

- Apply the appropriate push-pull devices in the system (Basiel, A. 1999). Once it is agreed how students want to engage with the system ‘Alerts’ can be sent to remind stakeholders of various milestones such as handing in course work.

- The system should provide a scalable opportunity for access to Web 2.0 tools. Front loading all of the features in the system may not always be appropriate. The academic and learning technologist or system architect should identify a plan to increase the tool set and functions as confidence and mastery of the stakeholders increases.

In the 2008/09 academic year a new cohort of learners will be using the new InTouch 2 system. Further study of the use and design of the learning system will continue. It is recognised that this will be an ongoing evaluation process as both the needs of the learners evolve and the utilities of the online environment adapt.
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YouTube (2008), [online], Available: www.YouTube.co.uk [June 2008].
Abstract

This paper reports on a case study which was undertaken to find the impact of course design and tutoring on the learning of a class of undergraduate students. The context was an online course titled “Computer Assisted Learning EDTC321”. An interpretive method approach was implemented to analyze the data collected via multiple tools. The results in general show positive student attitude toward both the tutor and the design aspects of the course.

Keywords: Online course design, teaching strategies, collaboration

Introduction

Traditional higher education course design is often based on the behaviorist approach, which emphasizes the teacher and the content as the central elements of education and assumes that all learners acquire knowledge of the subject content in the same way. Communication is generally between the individual student and the tutor. Learner–learner interaction is very low. Advocates of the new approaches to higher education, supported by the new online technologies, believe that design should facilitate learner-centered activities and allow for situated knowledge building process. Within this environment students develop new understanding through drawing on their previous experiences and engaging in discussion of concepts with their peers. A critical thinking community is an important goal of course design in this type of education. Collaboration between groups of learners and between groups and the tutor to solve a problem and in so doing to construct meaningful conclusions about real experiences are the central to this approach. The online tutor within a learner-centered course has a different role than in traditional distance education. The preparation of the course content and activities that foster collaboration and engagement is one aspect of the role; the facilitation of students while they are learning is another. The design of appropriate assessment tools and strategies is yet another. The process of education in web-based environment is a dynamic one which may be adapted according to the learners’ skills and the instances of learning at particular times. The tutor intervenes when needed but the learners themselves carry a responsibility for their learning.

Essential Design Elements of Online Learning

Interaction

Several studies have concluded that higher levels of interaction result in increased motivation; positive attitudes toward learning; higher satisfaction with teaching; deeper, more meaningful learning; and higher achievement (Entwistle and Entwistle, 1991; Garrison, 1990; Wagner, 1994; Swan, 2001). Online learning systems and communication technologies are very functional tools for nurturing the interaction process. Interaction...
is the key to learning. Many researchers have sought to investigate and categorise the types of communications that occur in the computer-mediated settings (Laurillard, 2002; Palloff and Pratt, 1999; Garrison et al, 2000). Moore (1989) suggested three basic interaction forms in the field of distance education: learner-content interaction is the first type and the most essential; learner-teacher interaction and learner-learner interaction. In a wider perspective, which considers interaction as a system, Garrison and Anderson (2003) described six forms of interaction adding content-content; the teacher-teacher; and teacher-content.

Collaboration

Scaffolding for instruction and learning takes place through interaction and interpersonal exchange: collaboration. The term collaboration is a basic idea in the process of learning because it is seen as a mean to promote the relation between the novice and the expert. Crook (1994) put it this way “In an effectively organized ZPD, the novice is assumed to be doing it along with the expert, who may be judiciously steering and prompting. Rather than being driven by showing and explaining, these encounters encourage the novice’s full ‘participation’ in the problem-solving act; they are conducted in the spirit of collaboration. P.83” Gokhale (1995) further proposed that “collaborative learning refers to an instruction method in which students at various performance levels work together in small groups toward a common goal. The students are responsible for one another's learning as well as their own. Thus, the success of one student helps other students to be successful.”

To design effective learning environment, Agostinho, Lefoe, and Hedberg (1997) believe that “Collaboration is an essential ingredient as it provides learners with the opportunity to discuss, argue, negotiate and reflect upon existing beliefs and knowledge. The learner is “involved in constructing knowledge through a process of discussion and interaction with learning peers and experts.” The advantages of collaborative learning are widely recognized (Panitz, 1997; Web et al.1997; Mcinnerney and Roberts 2004). The benefits are academic, social, and psychological.

On the other hand researchers have pointed out the difficulties that collaborative learning may encounter. For example, Salomon and Globerson (1987) believe that members of the collaboration team do not always function to their optimal level of expectations and potential productivity. In their view this behaviour is related to number of factors and low team performance may be due to the nature of the task that has been assigned to the team (Kerr and Bruun, 1983). Some tasks are not appropriate for teamwork and the attribute of the task may cause unproductive collaboration. Poor results could have stemmed from the lack of satisfactory group rewards. Other factors (Kerr and Bruun, 1983) may include the basics of the group formation (ability level), work and cognitive overload.

Student Autonomy

The interactive nature of online learning arguably puts more responsibility in the hands of the student than other types of education. Through the options available in learning networks, course designers have the opportunity to give students control over levels of study, range of content, number and form of delivering media, and time spent on learning. The learning experience can be customized to meet particular needs and interests (Doherty, 1998). The social constructivist approach demands the active participation of learners.

However this higher degree of control does not mean the abolition of the teacher role and an assumption that adult learner will learn everything independently. Some learners may
get frustrated or feel isolated without appropriate and timely feedback. In fact online learning requires more guidance from the teacher to help students, for example in the task of finding appropriate and relevant material from the vast information available in the Internet, or to facilitate small group discussion, to refocus learners. Some distance education scholars see students as partners of teachers. They can suggest a seminar topic within the main subject matter, to be discussed by the class or they could design reviewing tools and the assessment process. In a study conducted by Hubscher-Younger and Narayanan (2003), it was found that students rely on the teacher explanation more than textbooks or other sources to understand and learn. They argued that the reason was that teacher’s authority has affected the students’ perception of the course material and hindered their independent thinking and reasoning. They believe that to create a democratic space in online learning teachers should negotiate and delegate some of their authority powers to students and encourage constructive divergence between group members. In addition they should reduce the dominance of the more assertive students to assure equal voice and participation by all the team members. The reduction of direct teacher involvement and the use of collaborative group work can result in more interdependence and accountability among students. Schutte (1997) compared the effect of traditional versus virtual classroom environments on student test performance and student affect towards the experience. He discovered that the virtual group had significantly higher perceived peer contact and time spent on task, which was reflected in better material understanding and test results. Hammond (2000) conducted a case study research about small groups’ forums and the behavior of their members. He suggested that learners perceived positively the opportunity of their work to be assessed and reflected upon by other groups. They also benefited from the availability of the written ideas of other members, which has been stored and could be consulted at any time. In this study, the teacher’s role was to support learners in the process of communicative discussion “tutors will need to explain what is being attempted and why; and learners will need to take the risk of going public on their learning” p.260.

Social Presence

Educators are faced with the challenge of deciding the most appropriate method for teaching and learning online. The breaking down of time and place boundaries is one of the benefits of asynchronous online learning. However the full range of interaction between the teacher and the student in traditional face-to-face environments is not available in a web based learning environment (Rourke. et al., 2001; O’Sullivan, 2000). In the view of Peters (2003, p.99) “what happens in a discussion between two or more people is only partly mediated electronically”. In this mediated and virtual learning space a different set of techniques should be adapted to bridge the gap in the absence of face-to-face verbal cues, and non-verbal cues and expressions such as eye-contact, smiling, posture and arm position, leaning forward or backward, gestures, facial expressions, touching, speech duration, voice quality, laughter. Communication and media researchers have developed social presence theory to explain these behaviours. Short et al., define social presence as the “degree of salience of the other person in the interaction and the consequent salience of the interpersonal relationships...” (Short et al.1976, p.65). They proposed that social presence is a feature of the communication medium. Furthermore they suggest that communications media differ in their degree of social presence, which consequently affect the interaction.
process between the users. The measure of the psychological distance between the two sides of a communication process is called immediacy (Gunawardena, 1995). A high level of immediacy improves and strengthens social presence.

Gunawardena (1995) and Baker (2004) contend that many researchers found a substantial correlation between immediacy, social presence and learning among students in face-to-face environment. When teacher immediacy was high (socially present and close to students) learning is enhanced and improved both affectively and cognitively. A significant amount of research has been carried out in the last three decades in order to find about the effect of immediacy in the traditional classroom settings. However few studies have investigated this issue in the online learning environment from a holistic perspective. There is a clear need for more systematic research in this field.

**The Tutor Role Research**

As a result of an extended project, Anderson et al. (2001) formulated a model of critical thinking and practical enquiry framed by a community of inquiry model as an approach to investigate teaching and learning process within online settings in higher education. The assumption of this community model is that learning occurs through an interaction process between three central domains: cognitive presence, social presence, and teaching presence.

Anderson et al (2001) supported previous scholars’ categorizations of the tutor responsibilities within an online learning community. They classified teaching presence into three main areas: design and administration, facilitating discourse, and direct instruction. But they did not include the technical role of the tutor which has been identified by other writers (Berge, 1995; Ashton et al., 1999). They argued that learners are becoming more qualified to use the technology and that there are other means of help students can use to solve any technical difficulties without the direct involvement of the tutor. In their model social aspects of the teacher’s messages that directly relate to the content contributions from the students are incorporated in the teaching presence category. In addition the discourse facilitation role is more directly associated with teaching presence. They also termed the third responsibility as “direct instruction” instead of Berge’s “pedagogical” which they think is a general term that may refer to all three functions, and in place of Masons and Paulsen’s “intellectual” which they believe does not indicate teaching at all.

In order to develop a method to assess and measure teaching presence elements in online courses Anderson et al, (2001) developed a template. They constructed this instrument by finding indicators and examples which clearly describe and measure the concept of teaching presence.

Consistent with their categorization of the teacher roles they define teaching presence as ‘the design, facilitation, and direction of cognitive and social processes for the purpose of realising personally meaningful and educationally worthwhile learning outcomes’ (Anderson et al, 2001). Through this definition the essential role of the teaching presence is emphasised as a factor that integrates the various other elements of the learning process within the virtual environment.

Through analysing the computer conference transcript of an online course Anderson and colleagues identified as a guideline the following common indicators for their three main categories of teaching presence (Table 1):
Although the authors applied this system to analyse course discussion transcripts, we think that teaching presence categories may also be found in other areas of online courses. Anderson et al, acknowledge this and encourage other researchers to explore teaching presence outside course discussions. Tutor roles are in effect before and during the online learning experience. The tutor and in some institutes the design team, plans and prepares for the course long before it starts, the course should be ready for new students from the first day of the term. This includes the theoretical approach that the tutor adopts for the learning and teaching process, the outline, the objectives, the content, the activities and assignments, the assessment methods and any additional resources that are needed for the course. The organization and management issues commence at this phase and continue throughout the course. In addition all technical considerations of the course environment are the tutor responsibility.

The role of facilitating students’ learning is not limited to the tutor contributions to the discussion forums; sending e-mail messages, putting public notes, and any other form of communication with the students such as using telephone or face-to-face meetings are different means that could be used for this purpose. The researcher may find evidence within these different features of the online learning experience that indicate elements of teaching presence.

### The Study Context

The field of this research is an online undergraduate course titled “Computer Assisted Learning EDTC321”. This course is within the compulsory required programme of the degree of Bachelor in Educational Technology and Information (4 years). It is a third year level course offered by the Department of Educational Technology and Information, College of Education, at the University of Bahrain. The course is usually taught on campus within a “face-to-face” environment. In line with the University of Bahrain’s initiative to introduce E-learning to its programmes, this course was reconstructed into an online form.
The course was redesigned by the tutor and implemented in the first semester (September – December) of the academic year 2004/2005. WebCT was used as the online environment of the course. The course was taught using the Arabic language.

The main topics covered were: computers in society and in education; the fundamentals of educational computing and related learning theories; types of educational software; and evaluation criteria of software and websites. The lecturer utilized most of WebCT features: e-mail, discussion board, and calendar. The course content was delivered in six online lectures each requiring students to summarize and report back, take part in small group asynchronous discussions, and other activities. The total number of students who enrolled in this course was 29 and all agreed by signing informed consent form to take part in this research. This course was chosen because of its educational nature, and because it was felt students would have a special interest in reflecting on the role of technology. Additionally the choice was pragmatic as I had access to it through my working relationship with the course designer.

Problem-based learning was the general principle for designing the activities of this course. Authenticity and practicality also were important elements in the design of tasks in order to increase participation of students within a collaborative environment. For example one small group task was to evaluate some educational software. This required them to read the related chapter from the course textbook concerning the design of an evaluation form. They were then required to produce their own form (each team member was responsible for one section of the form) and to justify their choice of the items within the form. Next each member needed to use the form to evaluate educational software selected by the group from a website and to produce a final joint evaluation report about this software. The group coordinator facilitated all this work. Assessment was based on individual contribution and on the group’s final product.

Methodology
A case study approach (Merriam, 1988) was adopted to focus on the perspectives of both students and tutor in this course. In qualitative research, the researcher use a number of methods to collect rich, descriptive, contextually situated data in order to seek understanding of human experience or relationships within a system or culture (Silverman, 2000). This study looked for the key variables that may affect the process of learning and teaching within an online course. It sought to establish their significance and the relationship between variables and in determining the desired outcomes.

We used multiple data collection tools because we did not want to base this research on a single instrument outcome. To understand the range of human experience in online learning a full range of methods needs to be employed. Mixed methods (Goldman et al, 2005) have been used in online learning research to focus on complex social phenomena and their development over time. Research tools were used in the following way:

1. Student information questionnaire was implemented at the beginning of the semester to gather demographic and background information about the students.
2. A detailed questionnaire was used at the end of the semester to get feedback of the students and their experience and perception concerning the course design and implementation, and the lecturer.
3. 15 students were interviewed using semi-structured questions for 30-40 minutes after they had finished the course.
4. In addition to a written background from the course lecturer we arranged short meetings with her throughout the semester. A detailed interview for one hour was conducted with her after the end of the course.

5. We observed the textual interactions of the lecturer and the students. Online conferences messages of the course are stored electronically and their content being analysed. Statistical data about students’ participation in the course was also collected on monthly bases.

6. The course content and students’ work (assignment, activities, main project) was collected at the end of the course for the analysis purpose too.

The implementation of this methodology, enhanced through triangulation, is resulting in a credible account. Some findings from the detailed student questionnaire will be presented here as an example of preliminary work carried out.

**Results**

<table>
<thead>
<tr>
<th>Table 2. Course design items</th>
<th>SA</th>
<th>A</th>
<th>N</th>
<th>D</th>
<th>SD</th>
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<tbody>
<tr>
<td>1. The course was well planned and organized by the tutor.</td>
<td>2</td>
<td>20</td>
<td>2</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>2. The course objectives were clearly presented on the homepage.</td>
<td>1</td>
<td>19</td>
<td>4</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>3. The course content was available and easily accessible on the homepage.</td>
<td>6</td>
<td>18</td>
<td>2</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>4. The grading scheme was clearly stated and was always available.</td>
<td>6</td>
<td>15</td>
<td>5</td>
<td>3</td>
<td>1</td>
</tr>
</tbody>
</table>

Course assignments and activities designed and implemented by the tutor were seen as successful in allowing student interaction with other learners (24), however (12) students thought that course work did not support good interaction with the instructor. Many students (17) found that activities helped them to better understand course material, and that they especially enjoyed the practical type of course work (16). More than half the students (17) agreed or strongly agreed that the instructions were clear, and that assignments and activities were not difficult to answer (14). However they believed that the assignments made them work hard (15). Related to this was that reading and summarizing lectures helped to improve comprehension of the course content (19 students).
Table 3. Course assignments and activities items

<p>| | | | | | |</p>
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<tbody>
<tr>
<td>5</td>
<td>The course assignments and activities increased my interaction with the other students.</td>
<td>SA</td>
<td>A</td>
<td>N</td>
<td>D</td>
</tr>
<tr>
<td>6</td>
<td>The course assignments and activities increased my interaction with the tutor.</td>
<td>7</td>
<td>17</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td>The course assignments and activities helped me to understand the course material better.</td>
<td>3</td>
<td>8</td>
<td>5</td>
<td>12</td>
</tr>
<tr>
<td>8</td>
<td>I enjoyed the practical activities.</td>
<td>3</td>
<td>14</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>9</td>
<td>The course assignments and activities instructions were not clearly explained.</td>
<td>5</td>
<td>11</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>10</td>
<td>The course assignments and activities were difficult to answer.</td>
<td>1</td>
<td>7</td>
<td>4</td>
<td>12</td>
</tr>
<tr>
<td>11</td>
<td>The course activities made me work hard.</td>
<td>2</td>
<td>5</td>
<td>8</td>
<td>11</td>
</tr>
<tr>
<td>12</td>
<td>Reading and summarizing the lectures improved my ability to understand the course content.</td>
<td>4</td>
<td>11</td>
<td>6</td>
<td>8</td>
</tr>
</tbody>
</table>

Most students had positive experiences of working on assignments in collaboration with their team mates.

Table 4. Group work items

<p>| | | | | | |</p>
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<tbody>
<tr>
<td>13</td>
<td>My teammates helped me to understand and to work on the assignments.</td>
<td>7</td>
<td>13</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>14</td>
<td>I liked working in a group to answer the assignments.</td>
<td>10</td>
<td>9</td>
<td>1</td>
<td>5</td>
</tr>
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More than half of the students indicated that they did not have enough time to carry out the assignments, but they were satisfied with the main activity time scale.

Table 5. Time allocation items

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<tbody>
<tr>
<td>15</td>
<td>Not enough time was allocated for each assignment.</td>
<td>4</td>
<td>10</td>
<td>3</td>
<td>11</td>
</tr>
<tr>
<td>16</td>
<td>Not enough time was allocated for the main activity.</td>
<td>4</td>
<td>6</td>
<td>4</td>
<td>11</td>
</tr>
</tbody>
</table>

Most students agreed that the tutor provided them with clear information on how to participate in the course activities (22). More than half (16) of the students believed that there were too many assignments and activities.

Table 6. Activities organization items

<p>| | | | | | |</p>
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<tr>
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<tbody>
<tr>
<td>17</td>
<td>Overall, the tutor provided clear instructions on how to participate in course activities.</td>
<td>9</td>
<td>13</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>18</td>
<td>Overall, there were too many assignments and activities in the course.</td>
<td>0</td>
<td>16</td>
<td>6</td>
<td>5</td>
</tr>
</tbody>
</table>

Student Comments on Course Design and Organization

In the same section, an open question invited students’ comments concerning the course design and organization. Only (8) students responded and their remarks covered (6) comments on course homepage design and one comment about: the introduction to the
course, more assignment clarification, coordinator workload, too many assignments, and need for face-to-face meeting. Regarding the homepage design they would have liked an easier interface for the forums section, more lively colours, more flexibility, to add facilities like topics directory, and easier terms for some sections headings of the homepage. On the other hand two comments saw that the design was user friendly and that everything was available on the starting page. The coordinator role comment shows the workload that most of them had to deal with:

“The main obstacle in our group work was the late or the uncompleted members’ submissions which left the coordinator with more work. Frankly the coordinator workload was very big and she was performing the role of the less collaborative members or the very late ones in submitting their part of the assignments.” Amina.

Similarly the volume of assignments was a concern:

“Too many assignments which lead to student inability to perform them because of the pressure. It was meant to increase the interaction but this course put more load on the student than the traditional ones.” Badreya.

A student felt that the introduction session was quick; another suggested a regular face-to-face meeting with the tutor to provide guidance and participation assessment.

**Tutor and Tutoring**

In this section eleven rating scale questions and one open question were used to collect information related to the tutor role and tutoring practice from the students’ perspective. In general the responses gave a positive view of the tutor and satisfaction with the tutor communication, immediacy and facilitation actions.

<table>
<thead>
<tr>
<th>Table 7. Tutor and tutoring items</th>
<th>SA</th>
<th>A</th>
<th>N</th>
<th>D</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 I was able to contact the tutor using electronic tools during and after office hours.</td>
<td>5</td>
<td>18</td>
<td>2</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>2 The tutor response was quick and direct.</td>
<td>3</td>
<td>11</td>
<td>7</td>
<td>7</td>
<td>1</td>
</tr>
<tr>
<td>3 The tutor’s comments helped me in completing the assignments and the activities.</td>
<td>0</td>
<td>18</td>
<td>5</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>4 The tutor was friendly and respectful towards the students.</td>
<td>9</td>
<td>16</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>5 The tutor encouraged me to participate in the discussions.</td>
<td>5</td>
<td>14</td>
<td>4</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>6 The tutor feedback was constructive.</td>
<td>3</td>
<td>15</td>
<td>9</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>7 I felt that there was not enough tutor contact.</td>
<td>4</td>
<td>9</td>
<td>6</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>8 The tutor encouraged me to think deeply.</td>
<td>1</td>
<td>10</td>
<td>9</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>9 My relation with my tutor was close.</td>
<td>1</td>
<td>10</td>
<td>8</td>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td>10 Overall, the tutor acknowledged student participation in the course.</td>
<td>5</td>
<td>12</td>
<td>6</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>11 Overall, the tutor presented questions that helped me to learn.</td>
<td>5</td>
<td>15</td>
<td>3</td>
<td>6</td>
<td>0</td>
</tr>
</tbody>
</table>

**Contact and Feedback**

This was the subject of item 1, 2, 6, 7, and 10. Although few students (4) were not satisfied with the contact with the tutor, most (23) strongly agreed or agreed that they were able to increase their contact with the tutor through the electronic tools. Nearly half (14) of the students thought that tutor responses were quick and direct, while (8) disagreed. Most students (18) saw the tutor feedback as constructive and only (2) disagreed. There was a split in the opinion on the issue of tutor contact rate. (13) Believed that it was not enough while (10) were satisfied with the contact level. Related to the feedback issue many students (17) strongly agreed or agreed
that the tutor did acknowledge their participation in the course and some (6) thought that she did not.

**Learning**

Tutor cognitive support was dealt with in item 3, 5, 8 and 11. Again in general a significant number of students (18) believed that the tutor comments helped them in their coursework, but some (6) disagreed. Similarly (19) students thought that the tutor encouraged them to participate in the discussions while (6) did not think so. (11) Agreed that tutor supported them to think deeply in the topic discussions and (9) thought that she did not. Lastly in general most students (20) believed that the tutor questions had positively affected their learning and (6) did not agree.

**Social**

Results of item 4 and 9, shows that most students (25) on this course perceived their tutor as friendly and respectful toward them, and that she was close to them (17). However (8) students did not think they had close relationship with the tutor.

Student comments about the tutor and tutoring

Eight students responded to this question. Some comments (3) indicated a low level of tutor presence:

“We did not feel the tutor presence in the beginning but after a while, and her participation was little.” Ameera.

“Frankly, I think the tutor role was to present the assignments and to assess the contributions and the lectures summaries. I did not see the tutor noticeably encouraging thinking or providing feedback.” Fahima.

In contrast others (3) observed positive and engaged tutor activities:

“The tutor was always monitoring the students’ participations and she cared for her students, when she sees any non participant she would ask about the reason for being late and always comment on the contributions of the students in the discussion forum.” Maysa.

“The tutor role was very important in facilitating our learning and in encouraging us in this course though it was a new learning style for us.” Khawla.

In the view of two comments the tutor feedback was not appropriate:

“The tutor should praise the group as whole and not just some students only.” Wahaj.

“… She was encouraging particular students only.” Fatin.

Some students were not satisfied with tutor interaction and contact:

“There was no good interaction with the tutor in the discussion topics, some needed more clarification and the tutor was not always available during our free time.” Aysha.

“There should be an online weekly meeting with the tutor to help them through the difficulties they may face and to clarify any misunderstanding.” Hamdah.
Conclusion
Anderson et al (2001) define the tutor presence aspects of design and organization as building curriculum material, designing and administering group and individual activities, process of providing guidelines for the timely and sustained engagement of the students, and evaluation aspects based on the course objectives. In this study student responses indicated a successful tutor planning and organization of the course. Additionally results show that students appreciated the way that the course tutor provided the study material, objectives and grading scheme.
Knowledge construction is supported within online learning through the provision of challenging group activities and the use of collaboration strategies. Interaction and communication is fostered when students feel that they are accepted members of the learning community of a particular course. The survey results presented in this paper indicated that the students perceived the course assignments and activities as a successful means to provoke interaction among them. There was also strong evidence that the design of the activities, particularly the practical type, helped the students to improve their understanding of the course topics. On the other hand, limitations were indicated by some students: low interaction with the tutor was noted, high workload and lack of time also felt.
The tutors’ role in online discussion forums can vary from dominating the stage to the ‘guide on the side’ to just ‘the ghost in the wings’ (Mazzolini & Maddison, 2003). However facilitation is a task that cover other aspects of the online learning environment too (Anderson et al, 2001). In this course the students positively perceived the tutor communication, immediacy and facilitation actions.
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Interactivity: A Framework Model for Instructional Design and Research

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Interactions and Interactivity

Since computers are used for teaching and learning „interactivity“ has been used as an argument for the quality of that teaching formats taking for granted that interactivity will generally have an positive impact on learning. This supposition has rarely been questioned.

In the social sciences “(social) interaction“ means a sequence of actions between individuals which aim to influence one another. Since digital media are able to function partly similar as human partners the term “interaction” has been transferred to cases when one human partner was replaced by a technical system. “Acting” means any goal directed behavior including acts of communications.

In the domain of e-learning we often find chains of interactions which ideally resemble the situation of one tutor with one learner. The action of one partner A (e.g. the instructor) initiates a mental operation in the other partner B (e.g. the learner). As a result or a corollary phenomenon of this operation B acts now and that action has two functions: 1. It provides a feedback or answer for A concerning the previous action (does it was accepted? understood?) and 2. it initiates mental operations in the brain of A.

In the context of technology based teaching and learning “interactivity” names an attribute of a learning environment: The opportunity or the offer to interact with the instructional system. At first sight it may seem purposeful and practicable to measure the degree of interactivity. Indeed, there were measures for interactivity based on the counting of the learners’ key strokes or mouse clicks (US Military Handbook 29612, Definitions; cf. Shook, 2002) differentiating four or five levels of interactivity. In these cases the quantity of inputs is obviously seen as measure for the quality (or at least one dimension of quality) of the learning environment. Compared with classroom teaching this would correspond to the counting of the words and gestures of a teacher as a criterion for the quality of the instruction.

Even more complex taxonomies or models of levels of interactivity (e.g. Schwier & Misanchuk, 1993) are not very helpful for the design and development of multimedia learning environments as long as the relations between the levels or categories of interactions on the one hand and the respective learning processes (mental operations) are not clear at all. What is important is the contribution of any interaction to the learning process (cf. Sims, 1997).

Functions of Interactivity

In commercial ads and in non-scientific publications computer- or web based learning is often equated with interactive learning, even if many learning programs are as interactive as any book: one can start reading at any point, can start reading from the end, there is a table of contents, a glossary etc. The
only advantage to click with the mouse instead of turning pages is paid by the constraint mobility of the medium. The crucial question for instructional designers is which functions the features of dialogue-like communication have. Most instructional designers intend to represent important functions of the learner’s communication with a human tutor or trainer:

- to motivate,
- to inform,
- to foster understanding,
- to foster remembering,
- to foster application and transfer of learning and
- to organize and to regulate the instructional process.

These are the basic functions of any teaching in any form (Klauer, 1985; Klauer & Leutner, 2007). Interactions which do not support at least one of those functions are probably superfluous or even disadvantageous. A motivating function of interactivity is often claimed without any specification and reasons given. Actually there are reasons that it may be less effective if learners are passively taking information than being stimulated to be active. But this requires that the actions are suitable to support the process of knowledge building and there should be a theoretical idea of how that could happen. There are several possibilities how „interactivity“ could contribute to the learning functions.

**Interactions that can Foster Motivation**
An easy to implement possibility is encouraging utterances aiming to start or to continue learning. Especially important is avoiding any interaction that could potentially de-motivate learners. These are all interactions which could compromise the learners’ self esteem in any way. Interaction could also influence emotions or mood, which could then change motivation or cognitive processes (Domagk & Niegemann, 2009).

**Interactions that Provide Information**
Hints, e.g. hyperlinks to chapters or pages to work on can facilitate self regulated learning. Fault diagnostic based feedbacks with explanations of the kinds of errors and possible causes provide valuable information for the learners. A rarely realized but very important feature is an opportunity for learners to ask questions.

**Interactions that can Foster Understanding**
„Understanding“ means, that new information are integrated and assimilated into existing cognitive structures. Interactions that foster understanding could comprise alternative explanations, adaptive presentations or special help functions. Again, questions (by learners and by the system) are very important.

**Interactions that can Foster Remembering**
Remembering could be fostered by multiple interconnections with other content of the memory, by elaborations as well as by exercises (memorizing). Multimedia learning environments could integrate tools which support mnemonics and opportunities to work on exercises with feedback.

**Interactions that can Foster Knowledge Application and Transfer of Learning**
Transfer of learning can be supported by appropriate tasks and problems which require the newly acquired knowledge for solution. Generally the degree of automatic transfer of learning is often overestimated. Transfer can be promoted explicitly by explaining the possibilities of an application of the knowledge in specific situations. In the case of web based learning it is possible to use hyperlinks which present such information when clicked on. Another important possibility to foster transfer of learning is the systematic variation of exercises, tasks and problems. I situated learning any topic should
be represented by more than one problem task.

*Interactions that Contribute to the Regulation of the Instructional Process*

To support the process of self regulated learning overviews (site maps), the indication of chapters or task still to work on, feedbacks, recommendations for certain learning paths, hints for exercises, help for learning, cues and integrated tools for to plan learning and to manage learning time. Even learners who are able to learn self-regulated wish sometimes help by experts.

**Forms of Interaction and their Realization**

*Learners’ Actions*

The actions of the learner and the actions of the instructional system must be mutually related but the relationship must not be necessarily symmetric. From an educational technology point of view the following forms of learners’ actions can be differentiated (Niegemann et al., 2008):

- The self directed selection of the theme subject matter: This possible is normally indispensable although it seems ridiculous if that feature is used as an example of the interactivity of an instructional system and it is the only possible relevant action learners can do. Simple hyperlinks can be used to realize this action opportunity. In a content directory it is advisable to define the whole title or header as a hyperlink and not only the number or a bullet sign. If titles or headers are not self explaining a pop-up window with a short explanation are advisable. Short abstracts for text chapters can also be provided using this technique.

- The self directed selection of the sequence the subject matter is presented alone would be trivial. If certain sequences are especially useful for certain groups of users (e.g. depending on previous knowledge or interest) offering “guided tours“ is advisable. Realization is technically easy in a website. A user who decides for a certain guided tour should always be given the freedom to leave the tour in order to follow other links. Offering „tour-maps“ which inform on the track of a „guided tour“ could help such learners to return to the track.

- Allowing choices emphasizes the self-regulated learning: A choice between several levels of difficulty will be easy for most learners, but some need an invitation or a prompt, to decide for a higher level of difficulty. If concepts and exercises differ on other features than the level of difficulty, many learners will be overcharged except they get help for decision. Simple links and pop-up windows are often enough to offer such help.

According to experience learners like making vicarious action decisions if they are able to observe afterwards the consequences of their actions. This is the place it makes pedagogically sense to use interactive video sequences. Due to memory space and the costs of film making there are strong constraints concerning the number of the branches of an interactive video story. Writing a script for an interactive video showing the consequences of one vicarious action decision in all of the following action paths is not likely to be realized: No author ever was able to design good dramaturgies for many variants of one basic story (Domagk & Niegemann, 2009).

- Working on and the solution of tasks and problems is actually a challenge for programmers if learners’ activities should be more complex than clicking on and relocating objects on the screen. To put problem based learning environments into effect is mostly rather expensive, it often requires a bigger number of video- and audio-assets. An intelligent analysis of more complex learner input would be desirable, possibilities comprise:

  - Sorting tasks,
• Construction of concept maps and
• (Pseudo-) natural language input.

Requests and the use of help (= „passive help“) may imply an ergonomic challenge: A user should not be expected to know the exact wording of what he/she is looking for. User friendly help is context sensitive, i.e., it normally relates automatically to the content of the current page. Help concerning the handling of the program in general may be a special choice in a local help menu or there should be a specific button.

The possibility to complete or to modify presented learning material can be used to activate learners and to catch the attention, e.g., offering tables or graphs, which have to be completed by learners during instruction. Especially interesting is the possibility to annotate instructional texts with annotations similar to the comment function in MS Word.

Asking questions by learners is one of the biggest weaknesses of multimedia supported learning: Although commercial ads emphasize the „interactivity“ of e-learning, this elementary form of teacher-student interaction is often not at all realized. A real natural language interaction actually cannot be programmed by reasonable costs up to date. But there are several possibilities to allow learners to ask questions during learning in a multimedia learning environment: Rather simply to realize is offering a series (list) of pre-formulated questions, e.g. in a special „questioning window“ or frame. It is crucial that these questions match the learners’ need for information. To design such a feature requires the advice of experienced teachers for the respective subject matter.

It is important that the questions match the learners’ need for questions, experienced teachers or trainers of the domain know frequently or typically asked questions and should be consulted. A somewhat more challenging possibility is the programming of a kind of “question parser”, i.e. a procedure that allows to generate questions using a given set of concepts and several subject matter related „question stems“. Combinations which seem to make no sense in the given domain will be rejected with a demand to reformulate the question. Examples for question stems are: How are X and Y related? What is the origin of X? How can Y be enforced? X und Y could be replaced by concepts out of a list by „drag and drop“ or a similar technique; this format allows a somewhat greater flexibility than selecting questions from a given list.

A third form of enabling questioning is pseudo-natural language questions: In that case a free input of the answer is possible. The program evaluates the input regarding the occurrence of question words and key concepts or their respective word stems as well as the sequence of the words. Irrelevant words are ignored. Depending on the domain multiple questions are possible. To realize the generation of answers to such questions there is technically a matrix in the background which represents all combinations of relevant words and interrelates them with appropriate answers. Pedagogically interesting in this context is also the idea of question based navigation: Programs can be organized in a way that certain branches are only accessible by questions (instead of a “next”-button). Learners are then required to decide what they want to know at that point. The conscious decision for a certain question should have positive effects on learning and memory.

The input of answers on questions asked by the instructional system is easy as long it means marking correct alternative of multiple-choice-items, fill-in texts or „drag and drop“-actions: There are pre-programmed routines in every modern authoring system. If whole sentences are required techniques to handle pseudo-natural language processing are can be used. In case of the processing of several sentences or even short essays...
automatic processing is possible in principle but very expensive (e.g. LSA: latent semantic analysis). A procedure much easier to realize is the presentation of a sample solution which are offered the learner simultaneously with his/her solution requiring him/her to compare and to evaluate by him-/herself. An alternative to sample solutions could be criteria lists.

Controlling or regulating systems is often seen as a standard case of a high degree of interactivity in simulations and (serious) games. From a pedagogical point of view it is desirable to describe and explain the reasons or causes of a certain system behavior if the effect is non-trivial: Learners should recognize which combinations of conditions are causing the observable effects. Specific diagrams which explain the influence of the input could be suitable. An even more extensive approach aims on the construction of simulation models by the learners themselves. Results of respective research is reported by Hillen, Berendes & Breuer (2000; and Hillen, Paul & Puschhof, 2002). Two examples of this kind of software which fosters modeling from kindergarten to university are “AgentSheets” (http://www.agentsheets.com) and “NetLogo” (http://ccl.northwestern.edu/netlogo).

A rarely realized form of interaction concerns integrated help for planning and regulation of the learning process (goal setting, time planning): Especially in comprehensive learning websites many learners need help to plan their learning activities, e.g. a series of questions related to learners’ goals and their available time. The system could later remind on the originally intended goals and time budget in cases a learner moves away from his goal. But the learner should always have the chance to change goals and time spontaneously. Such a help system could also be extended by tools and hints for learning techniques and strategies.

**Actions of the Instructional System**

Regarding the instructional system the following actions could be realized (Niegemann et al., 2008):

1. The presentation of information comprising texts, pictures, audio and video sequences as well as animations can be called „interactive” if the design is adaptive, based on information on the individual learner. This has been the essential goal of the idea of „intelligent tutorial systems“ (Wenger, 1987). The possibility to develop such systems was overestimated in the 1980s but the very idea is alive. Adaptivity is an important factor of efficiency of instructional media. Information required for adaptation (e.g. level of difficulty for tasks or necessity to present additional texts) can be acquired by questions to the learners, by input of a trainer or by building up successively a learner model based on the diagnostic tests and assessment functions of the system.

2. Asking questions and assigning tasks, problems and exercises is rather easily to realize. Much more complicated is the design of opportunities to get complex answers (texts) and to appropriately evaluate such answers. Most common are standard item forms: multiple-choice, fill-in, drag and drop and the input of single words or short sentences. Interesting possibilities are provided by the use of concept-mapping technology for the assessment of conceptual knowledge (Eckert 1999). This technique allows a sophisticated comparison between a learner built concept–map and a concept map constructed by an subject matter expert.

3. Failure tolerant processing and feedback on input: It is always annoying if a learner writes (puts in) an answer to a question or the solution of a problem and despite it is essentially correct the system react with “wrong answer” due to a minor formal error (e.g. an orthographic error, a space key stroke). The input processing should at least be able to identify and to ignore superfluous spaces before or behind an answer to ignore.
More difficult is the design of input processing routines that are able to tolerate spelling errors to a certain degree. Failure tolerant does not mean to accept any spelling errors without a comment but to interpret the input correctly as regards content; there may well be a prompt indicating the formal failure. Reasonably the learner should get a hint on the failure, also the program can ask whether the correct input is what he or she meant. There has always to be decided what should be tolerated and what should be rejected. The costs of the programming must be balanced with the benefits of the identification of rare spelling failures.

The problem with active help is the identification of indications and indicators for situations learners wish to get help. There are solutions in computer science (AI) since about 30 years but practical application showed that psychological aspects are important too. Even help which should objectively be useful are often rejected by different reasons. Indicators for need for help could be: Dwelling on the same screen without any activity (like mouse clicks, key strokes), repeated failures or intricate sequences of action. It is important that the learners can immediately reject any offer for help.

Without a feedback on learner activities no learning program can be named „interactive“. But the quality is crucial. A simple „wrong“ or „it’s a pity“ feedback on an incorrect solution is pedagogically not sufficient: At least the correct answer, if possible with explanations should follow immediately to make the failure initiate a learning process. Feedbacks based on error (failure) analyses are desirable. Planning and programming error analyses is often quite sumptuous. They are easier if the tasks or questions are predefined. In such cases any categorisable failure (answer) can be treated as a specific case of input. E.g. if every task in a computation trainer is generated randomly the program has to generate for every category of failure the typical (false) answer in order to react appropriately if a categorisable wrong answer occurs. As the (numerically) same wrong answer can be caused by different thinking failures there should be alternate error explanations. To identify suitable error categories field studies may be necessary, but often interviews with experienced teachers, instructors and trainers are sufficient. In case of web based learning environments it is reasonable to save all answers and solution and to analyze them from time to time in order to identify systematic thinking failures or inappropriate mental models of the subject matter. Every fault analysis will result in a remainder category for input failures or other not categorisable errors.

Generally in all evaluating feedbacks the learners’ self esteem must not be damaged in any way. Just because an instructional designer does not know the learners personally strict reserve in case of negative feedback is indispensable.

**What makes interactivity efficient?**

Up to now we described functions and forms of interactions and showed possibilities of interaction design. But when is interactivity in multimedia learning environments effective and – regarding the efforts to design it - efficient?

The efficiency of interactions in multimedia learning environments is influenced at least by the following variables (Fig. 1):

- The quality of the content relevant information learners gain by their specific interaction and which would not be available without the interaction,
- The quality of the cognitive (mental) operations initiated by “actions” of the learning environment (perceived changes of the offered information),
• The kind and degree of the cognitive load of the learners’ working memory during learning process,
• The activated prior knowledge of the respective learner,
• The respective learners’ metacognitive and self regulatory abilities realized in the learning situation and
• Personality traits as well as motivational and emotional states of the learners during the learning situation.

![Frame model of variables relevant for efficient interactivity in multimedia supported instructional processes](image)

Fig. 1: Frame model of variables relevant for efficient interactivity in multimedia supported instructional processes (cf. Niegemann et al., 2008)

While the assumption is accepted that these variables influence the efficiency of learners’ interactions in multimedia learning environments, the question emerges how this happens and how the variables are functionally interrelated. As a first step to answer these questions Niegemann, Domagk and Hessel developed model („NDH-model“) which is used as a base for empirical research studies (Domagk & Niegemann, 2009).

Given a learner with a certain previous knowledge and specific motivational and emotional traits and states the multimedia learning environment (MLE) presents certain information as well as opportunities to act. In interrelation with the presented information activated previous knowledge as well as the motivational and emotional attributes and states the MLEs’ opportunities to get information and to act could provide an incentive for an action (cf. Rheinberg, 2006). Bases can be curiosity or the expectation of certain consequences of the action.
Depending of the learners’ metacognitive abilities he/she will now plan and realize an action or a sequence of actions (self regulated). This action (technically a mouse click or a mouse movement, key strokes to write text, moving a joystick etc.) results in a more or less complex information processing of the system. Now the MLE „acts“, what means, that the displayed information is changed. If the MLE is designed professionally the new information offered aims to initiate or to change mental models, schemata or cognitive structures.

It is this initiating or changing of mental operations and structures that is crucial for the efficiency of interactions.

As for the theoretical modeling of mental operations there is considerable need for research. A very important category of mental operations for multimedia learning was named “supplantation” and described by Salomon (1979).

The efficiency of the learning process depends partly on the amount of the cognitive load of the working memory during the processing of the new information. Especially extraneous cognitive load can be influenced by the design of the learning environment, last but not least by the conditions that enable interactions between the MLE and the learner resp. the forms of the interactions.

Fig. 2 shows the extended NDH-model, where the extension relates to emotional processes which were investigated up to now only marginally.
Conclusion
Interactivity in multimedia learning environments is not an indicator for quality on the outset. Whether certain interactions in the context of a certain subject matter and certain addressees foster or hinder the learning processes depends on several variables. Designing (multimedia) learning environments requires an analysis of their interdependence. The determining factors are the cognitive processes which are initiated or influenced by the respective interactions. Learning processes are also affected by mood and emotions, which could be activated by different internal or external learning conditions including (inter) actions. Theories of multimedia learning and respective empirical research furthermore indicate possible problems resulting from the cognitive load produced by required learners to act and to plan actions, especially if interactions are not closely related to the subject matter. The influence of mood and emotions on learning in the context of interactive multimedia learning environments is rarely investigated. Regarding the rapidly increasing interest in designing and using serious games this gap in research should be closed in near future.
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Web Accessability towards Cognitive Limitations

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Abstract
In today’s information society, accessing information and education is central to development and social empowerment. National and international accessibility laws and policies, like the World Wide Web Consortium (W3C) standards and guidelines, have been adopted in many countries. Unfortunately, these initiatives almost exclusively address physical limitations (sight, earring, mobility, etc.) providing almost no recommendations for cognitive limitations. Even a Web accessibility guideline like WCAG 2.0 has been criticized for this. Such a weakness may increase a major society problem given that national statistics show that 30% of the Canadian population have severe reading problems or other cognitive limitations impeding their access to written information. In this paper we present our conceptual framework, research methodology and major results namely, four adaptation strategies to reduce text complexity. Finally we will discuss the impacts of our results and future work to make information technologies more accessible for people with cognitive limitations.

Introduction

Our research program has for subject the accessibility to reading and to information by taking into accounts a very problematic dimension, being, users with cognitive limitations. There are several causes to those limitations which, although badly defined, affect apparently a wide part of the population. So, according to Statistics Canada (2003), 30 % of the Canadians are illiterates and 60 % have difficulties to understand what they read. The accessibility to reading skills at the elementary school and the accessibility to information in view of the participation of citizen are thus major stakes.

We shall expose at first some considerations on the universal accessibility and on the problems of name and definition surrounding the concept of cognitive limitations. We shall examine then the accessibility to reading and to information towards this type of limitations. Then we shall expose our strategies of research and innovation for the design and the evaluation of the accessibility to reading and to information towards cognitive limitations. We shall also present four modalities of text adaptation to mitigate cognitive limitations, among which, three constitute innovations. Finally, we shall discuss the first reactions of the public to three of these modalities of text adaptation.

Universal Accessibility
The "Agreement relative to the rights of the handicapped persons" (UN, 2006) plans that States Members take measures suited to insure the elimination of the obstacles and the barriers to accessibility so that the disabled persons can benefit of their access rights to the physical environment, the transport, the information (article 9). The agreement also states that States Members give to the handicapped persons the possibility of acquiring the necessary practical and social skills so as to facilitate their full participation to the educational system and to the life in the community (article 24).

This agreement, which came into effect on May 3rd, 2008, was ratified by more than 80 countries and 120 others signed it to ratify it later. This commitment obligates these countries to take political and economic measures to identify and eliminate the obstacles and to establish the standards of accessibility to public places, to information, to education, to transport and to other spheres of the social life (UN, 2006).

Accessibility is now part of numerous countries, municipalities, institutions or groupings preoccupations. It is the resultant of several combined factors which gave birth to justifiable demands of groups marginalized and excluded from the most fundamental activities such as education, work and community life. Those social pressures exercised by diverse groups introduced big changes affecting various aspects of the social and democratic life. Most of the laws which were drafted with the goal to satisfy these new requirements came along with constraints to accelerate these transformations. That we speak about obligation of accommodation or about normalised arrangements, our current societies invite those who offer services or conceive products (collective spaces, buildings, objects, etc.) to respect a set of rules, of principles and of standards aiming to the universal accessibility.

Although widely spread and used, the concept of universal accessibility is regrettably very little formally defined. The sense of the expression is rather induced by the examples sketched to illustrate it, by aims and values connected to it and, in a more general way, by the process of creation and conception which contributes to actualize it, being, the universal design.

The universal accessibility means at first and above all accessibility, meaning to qualify the character of a product, in the broad sense, or a service which does not present obstacle to its user. The universal qualitative translates the recent opening and the extension of the accessibility to every human being, and for any type of products, that being the physical products, the services, the information, etc., while, more traditionally, the accessibility was more associated and limited to the architectural dimension and concerned almost exclusively the persons in wheelchair. During the last decade, we thus attend in a spread and massive way to the extension of what is aimed by the accessibility, being the populations and the groups as well as the diverse aspects of life in society, going more and more widely beyond the architectural context. In brief, the universal accessibility is the expression used to show the fact that the accessibility extends to the totality of the human beings, whatever are their characteristics, and touches the totality of the possessions and the services of physical nature or not. The universal accessibility so makes echo for the demands of the various groups which were excluded from the activities of the community and aims at the equity as well as at the full democratic exercise for all (Rocque and Langevin, 2005).

In the simplified text version of a brochure dedicated to the universal accessibility, the City of Montreal (2008: 5) proposes the following definition: The universal accessibility is the access to all the buildings,
to all the services, to all the programs and to all the information for everybody.

**Universal Design**

The universal design is the inescapable extension to actualize the accessibility. The universal design is at the same time a domain of activities and a process of conception, the object of which is the creation of products (objects, spaces, buildings, works, services, etc.) that must satisfy criteria and requirements of diverse natures to answer the most adequately possible to the variety of the characteristics and the capacities of the users. What is aimed by the universal design is to obtain comparable results in the realisation of a task by a variety of users of multiple characteristics and of particular capacities (UDC, 1997). Universal accessibility and universal design are registering into one new paradigm of conception and creation of products or services.

The figure 1 presents the universal accessibility as the aim of the process of universal design and at the same time as its resultant. We distinguish three types of universal design, the first one in aid of persons with particular characteristics (specific design), the second aims to integrate specific adaptations in an including perspective (design of interfaces), and the third which tries to meet the needs of all in an including optics (widened design).

Even if the widened design seems to correspond more to the ultimate purposes of the universal accessibility, it would be an error to neglect the two other types, at first because the widened design demands particular conditions. For example, it applies more easily to the conception of something new than to the adaptation of an already existing element (ex.: construction of a new building VS adaptation of an old building).

<table>
<thead>
<tr>
<th>Aim</th>
<th>Processus</th>
<th>Resultant</th>
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| Universal accessibility | **Universal design**  
  * **Specific design** Design aiming at the conception of adaptations for the users with particular characteristics.  
  * **Interfaces design** Design aiming at the integration of specific adaptations into widened design in an including optic.  
  * **Wide design** Design aiming at the conception of adaptations by taking into account a vast group of users' characteristics in an including optic. | **Universal accessibility** |

*Fig. 1 Universal accessibility and three types of universal design*

In fact, the three types of design must be considered as so many available processes to get closer to the ideal of universal accessibility. We shall see finally that our societies, in view of certain elements, can have big hesitations to accept some widened
design. It is the case notably for several cultural tools of communication, exchange and measure that have been rooted for a long time in our collective traditions.

Target population
As we underlined it from the outset, a large number of persons have cognitive limitations. But the particularities and the needs of these persons are apparently as diversified as the causes at the origin of the difficulties they have to live with (dyslexia, illiteracy, insufficient control of the majority’s language, intellectual incapacities, etc.). This heterogeneity seems to vow to failure any attempt of universal design, especially since the choice of a name to speak about this phenomenon and the choice of a definition to identify the target population does not make the unanimity.

**Designation and Definition Problems**
The expression cognitive limitations is not a designation commonly used in the vocabulary related to the field of universal accessibility. Several authors use other terms such as cognitive impairments (Grabinger, Alpine, Ponnappa-Brenner, 2008) cognitive and learning difficulties (Keates, Adam, Bodine, Czaja, and al.2007), cognitive deficits (Laff and Rissenberg, 2007), cognitive problems (Fugger, Morandell and Prazak (2006), cognitive disabilities (Friedman and Bryen, 2007). There is no uniform definition of these difficulties of cognitive nature, doubtless because of the multitude of the concepts used to refer to it. According to Keates and his co-workers (2007), those designations take different senses not only through the various research communities, such as in education, in medicine, in design, etc., but also between various cultures and regions. They add that even the basic concepts, such as cognition and thought, who serve generally for defining those terms, have no universally accepted definitions.

Besides, Adam and Gill (2007) narrowly associate the cognitive limitations with a cognitive overload lived by a person during the realization of a task. They even considered them as synonyms. This proposition, clearly of ergonomic nature, joins in a perspective centered not anymore only on a person and his/her difficulties, but rather on an interaction between this person and a task.

**Choice of a Designation and of a Definition**
We chose the expression cognitive limitations. A limitation is the action to limit or its result, while the adjective cognitive refers to the knowledge and its processes. In an approach centered on the interaction Person-Environment (Rocque, 1999; WHO, 2006; UN 2006), we define the cognitive limitations as all the consequences of a cognitive overload which is produced by the inadequacy between the characteristics of a person and the requirements of tasks of cognitive nature, especially those who require literates’ skills. Among the cognitive limitations, it would be furthermore interesting to distinguish and to prioritize those of functional nature, meaning associated with cognitive tasks essential to the autonomy and social participation.

This definition presents several advantages. At first, it establishes clearly a distinction between limitations and overload. The overload is the product of the interaction Person-Task, while the limitations are the consequences of this overload on the person’s activity. Among these consequences, we can consider the incapacity to realize the task, in all or in part, the phenomenon of marginalization which can ensue from it, as well as the possible effects on the self-respect and the motivation. The integration of the task requirements in the equation is another advantage. It is, to our knowledge, the first time that the cognitive limitations do not make directly and only reference to the characteristics of the persons, but rather to the
consequences of an interaction. This change of paradigm eases the problem of the heterogeneousness of the target population and increases our collective responsibilities with regard to them.

With this definition, the target population thus includes all the persons who live with the consequence of a cognitive overload during the realization of a task of cognitive nature. On the other hand, the definition of the functional cognitive limitations limits the phenomenon to the cognitive tasks essential to the autonomy and to the social participation. For example, the chess game or the composition of a poem, although they are tasks of cognitive nature, would not be eligible for consideration here. Let us underline finally that the adopted definition insists on the tasks requiring literate skills. This precision is justified by two major problems: pupils' large number which, because they did not learn to read during the first years of school, quickly accumulate a major school delay and become at high risk of dropping out once in secondary, as well as a large number of citizens with difficulties reading or understanding what they read, limiting henceforth their participation citizen.

Accessibility and Cognitive Limitations

The limitations of cognitive nature are invisible and difficult to simulate. The persons with those limitations have been the most overlooked in the actions realized in universal accessibility until now (UN, 1995; Keates and Varker, 2007). For them, the equity remains too often a praiseworthy intention in a virtuous speech. In 1995, the World Organization of the United Nations concluded to a pitiful failure our answer to adequately respond to the specific needs of the persons with cognitive limitations while underlining, that these limitations are second in importance after those who are brought forward by the ageing.

**Overlooked by the Designers**

Hardly 8 % of the professionals on whom the development of measures of adaptation rests worry about cognitive limitations while 80 % of them take into account limitations of mobility or sensory nature. More than the majority of them, or 60 %, declare to never care, or very rarely, about cognitive limitations while an unimportant percentage, or less than 1 %, has such an attitude towards the capacity of mobility or the sensory limitations (Imrie and Hall, 2001). This data, resulting from vast inquiries, demonstrate to what point the persons with limitations of cognitive nature are, and by far, the most overlooked at during the conception of adaptations.

Accessibility to Learning

An approach in emergence suggests insuring a better accessibility of the pupils to the learning beyond their differences. It is about the Universal design for learning (UDL). Pulling its previous history from the concept of universal design in architecture, the UDL consists of an approach to conceive curriculum rich in technologies, at the same time flexible and capable of supplying a variety of options to answer the various needs of the pupils, by considering particularly the pupils with incapacities. This approach is widely adopted in the United States and encouraged by the US Department of Education (Rose and Meyer, 2002). The UDL anticipates the differences in strategies and incorporates alternative methods into the educational materials and into the methods of education and evaluation to decrease to the minimum the barriers to the learning of the pupils (Rose and Strangman, 2007). But, as we shall see for the accessibility to information, the incapacities or cognitive limitations are little taken into account there.

Accessibility to Information

The efforts in this domain are especially dedicated to the design of interfaces for
mobility, visual or earring limitations, while neglecting the cognitive dimension (Bartlett, 2001; Imrie and Hall, 2001; Abascal and al., 2002; Gouvernement du Canada, 2000, 2003; Rocque and Langevin, 2005; Seaman, 2006; Adams, 2007; Keates, Adams and al., 2007; Laff and Rissenberg, 2007). About the accessibility to the Web and the gains acquired in this domain by the persons with limitations, Friedman and Bryen (2007: 205) underlines that « Web accessibility for users with cognitive disabilities lags far behind the general population and behind Web access for other disability groups ».

The World Wide Web Consortium or W3C was created in 1994 to lead the Web to its full potential by developing technologies (specifications, guiding, software line and tools) which facilitate the exchange of information, the business, the inspiration, the free will and the collective understanding. One of the first objectives of the W3C is to give these advantages to all the individuals, whatever is their equipment or software, their network infrastructure, their first language, their culture, their geographical location or their physical or mental aptitudes. However, in the standards of accessibility to Web established by the W3C, the few rare elements relating to the cognitive dimension are considered as secondary priorities (Bartlett, 2001; Abascal, Arrue, Garay and Tomas, 2002; Seeman, 2006; Keates and Varker, 2007; Laff and Rissenberg, 2007).

The necessity for a simple and understandable language in the context of the accessibility to the Web is indicated in Web Content Accessibility Guidelines (WCAG). Web Accessibility Initiative (WAI) of the W3C proposes those directives. The most advanced version of WCAG 2.0 (World Wide Web Consortium, 2008) is structured in four principles clarified by 12 directives. The third principle, « the understandable contents », concerns the cognitive dimension. It includes the following directives:

- Make text content readable and understandable.
- Allow the web pages to appear and to behave in a predictable way.
- Help the users to rectify their errors

The first directive is certainly interesting, but little useful without precision of stake in work. Keates and al. (2007) do not go farther by suggesting to divide the information (‘’chunk the information’) in simple and accessible fragments. According to them, it is a question of reducing the text to the minimum while leaving it understandable. In a magazine of literature on the accessibility to information presented in the form of text, with the exception of the advice, often repeated, that it is necessary to simplify, but without any other precision, the most advanced proposition which we found is the "Easy-to-read", a set of redaction rules proposed by Inclusion Europe (1998) on how to write texts and publications that are more accessible to people with intellectual disabilities.

Research and Innovation Strategies

The figure 2 presents the five main research and innovation strategies that our team, the Groupe DEFI Apprentissage (GDA), has adopted in the view of improving the accessibility to reading and the accessibility to information in regards of the students and citizens with cognitive limitations. We are now introducing those strategies.
Interdisciplinary Approach

No discipline can, on its own, supply the competencies and the necessary framework to the universal design, especially in regards to the cognitive limitations. It is why our team has adopted an interdisciplinary approach that gathers researchers who have skills in the six disciplines presented in the first element of the figure 2 (humane ecology, special education, cognitive psychology, ergonomic, artificial intelligence, ICT in education).

Thanks to co-workers' network, we borrow among others the abstract frameworks, technological or methodological framework in developmental psychology, linguistics, IT genius and engineering industrial automation.

Foundations of the Design in Regards to Cognitive Limitations and Technologies of Text Adaptation

This second strategy combines the four main foundations that we use for the universal design in regards to the cognitive limitation as well as the technological innovations in support to the text adaptation.

Characteristics of the Reference Group

Intuitively, we had noticed that often while considering those who live important limitations, the universal design manages to eliminate obstacles for all the users. This intuition was confirmed by the concept of reference group, that is a restrict group of individuals whose particular characteristics will serve as reference to conceive favorable adaptations for a target population with more diversified characteristics. For example, the persons in wheelchair serve generally as reference group for the architectural arrangements towards the persons having limitations of mobility. The reasoning is sample; if a building is accessible to a person in a wheelchair it will be accessible for all.

We chose the persons having intellectual disabilities as a reference group in order to take into account the difficulties that people
with cognitive limitations live with. This choice is due to the fact that the persons having intellectual disabilities present a set of characteristics of cognitive nature very varied and well known: deficit of the selective attention and the working memory, lack of cognitive and metacognitive strategies, difficulties treating what is abstract and symbolic, difficulties in situation of problem resolution, difficulties of transfer and generalization, etc… (Dionne, Langevin, Paour and Rocque, 1999). With such characteristics, those persons are very badly equipped to live in an environment conceived by and for people who do not have difficulties executing cognitive tasks. From this point of view, the analogy with the persons in wheelchair in our cities and buildings of before 1980 is striking. As reference group, the persons with intellectual disabilities present another advantage for the universal design. Indeed, the degree of severity of their disabilities varies considerably from an individual to the other one, of mild to severe, allowing to envisage various levels of adaptation.

While forming only a tiny part of the target population, the persons with intellectual disabilities constitute nevertheless an important reference group. With a rate of prevalence of at least 1,58 % of the population (Larson, Anderson, Lakin and Kwak, 2000), it is the most frequent type of disabilities (at least 110 000 persons in Québec, 500 000 to Canada). Even if some manage to learn to read, the majority of the pupils having mild intellectual disabilities and practically all those who have moderate to severe disabilities stay illiterates after 15 years of school. While the goals of their education are the autonomy and the achievement of a real social participation, they become dependent and isolated citizens socially (Bouchard and Dumont, 1996). If the accessibility to reading and the accessibility to information were within the reach of the pupils and the citizens with intellectual disabilities, they would also plausibly be for all.

**Identification of Specifics Factors of Obstacles**

Any initiative of adaptation or design in optics of accessibility passes by the identification of specific factors of obstacle to the considered type of limitations. Thanks to the always finer ergonomic analyses, we came to the conclusion that the main factor of obstacle for someone to realize an activity of cognitive nature is the complexity of all that is supplied-imposed to the person to realize that activity. In ergonomic terms, we will speak of the “complexity of the prescribed task” (Leplat and al., 2002; Darses and de Montmollin, 2006) which places the person in a situation of work overload. Our object of study thus contains two additional complementary dimensions, being the complexity and the simplification. To this day, we identified 10 factors of complexity the most frequent of which are the instability which shows itself everywhere in our communication tools, exchange and measure. The instability is multidimensional (semantic, morphological, symbolic, of code, of orientation, of procedure, etc.).

The complexity will affect largely the legibility and the comprehensibility of a text:

- **Legibility:** In regards to the accessibility to reading and to information, the instability of the written code constitutes the first factor of obstacle. With, in French, some 4 400 correspondences between phonemes (pronounced sounds) and the graphemes (ways to write them), this instability disturbs considerably the legibility of the texts. For example, the slide show AUTO (Langevin and Fauteux, portail defi-apprentissage) presents 576 plausible manners to write the simple word "automobile" (in French) considering…
the multiple graphemes which can correspond to both phonemes [ o ] and [ t], of the possibility for a simple or double consonant (t or tt), of the possible presence of a dumb "h" or of an accent, as well as marks of the plural. Other sources of complexity lead induce a morphological instability of letters (capital letters or small letters, handwritten or printed writing, fonts, style, size, etc.).

- Comprehensibility: in the complexity of the code are added all the factors of complexity connected to the expression of writing and which can make a text more or less difficult to understand: chosen words, syntactical constructions, more or less useful details, structure of the text, etc.

Ergonomic, Particular Principles and Rules of Adaptation

A better understanding of the complexity allowed developing a process to counter it: particular principles of ergonomics set up rules, adaptation rules with variable degree, from mild to extreme (Langevin, 1996, Langevin, Dionne and Rocque, 2004). This process was at the base of innovations to help the pupils with cognitive limitations to master essential skills toward autonomy and that, at the age suited to each skill: ex. alternative strategies of payment (Drouin, Langevin, Germain and Rocque, 1998, 2003), an adapted calendar (Langevin, 1994).

Modalities of Text Adaptation

Our strategies of reduction of the complexity were of use to the development of three modalities of text adaptation to be used according to the severity of the cognitive limitations. A fourth modality (sound version) completes the possibilities of text adaptation:

- Simplified text (ST): useful for every user, this modality consists in simplifying the text while leaving intact the visual elements and the organization of the pages. Taking support on propositions of edition (Inclusion Europe, 1998), we have elaborated a set of general rules of text simplification as well as specific rules for particular types of texts (Duquette, Rocque and Langevin, to be published). Rules of legibility and rules of comprehensibility are distinguished. The simplified version of a text is easier to read (legibility) and more so to understand (comprehensibility): superfluous details taken out, familiar words, simple sentences, etc.

- The modality ST can be used by itself. It can also be combined to the following modalities of adaptation of the legibility plan being, in regards to the more important cognitive limitations.

IMPORTANT NOTE: The following modality (AO) is an extreme measure of legibility intended for the exclusive usage of the pupils or the citizens who have average to severe intellectual incapacities and who, at present, live illiterates after 15 years of school.

- Alternativ ortograf (AO): This modality consists in transposing the text into an alternative code based on only 34 correspondences grapheme-phoneme instead of 4400 in French (Langevin and Rocque, 2007; Langevin and Germain, 1994). The AO rests on the phonetic transcription of the words, such as presented in a dictionary, but by using the common alphabet and the «archigraphemes» proposed by Catach (1998). It is a question, for each phoneme, of choosing the grapheme which
represents it the most frequently or which is the least confusing. For example, the graphemes corresponding to the sound [o] in French, (that is o, op, bone, ot, in, in, aut, etc.) are all replaced by the letter "o". Rules of writing (ex. choice of the font, two or even three spaces between the words) increase even more the legibility.

- The AO presents three advantages: its simplicity for the user, its conviviality for the relatives who needs only a few minutes to get acquainted with it, and its usability in regards of the autonomy (writing lists, understanding and writing messages, following instructions, reading of textbooks, books and documents so adapted of information). As the Braille for the blind persons, the AO is not the ideal, but it is better than illiteracy.

- Ex. «le bateau blanc avance sur l’eau» transposed OA : «le bat o blan avans sur l’ o» (in French).

- Phonetic support (PS): This modality leaves the text in conventional spelling while supplying to the hesitating reader keys to decode. It consists in adding archigraphemes of the alternativ ortograf over the complex graphemes of the conventional spelling and to shade off in grey the dumb letters (Roland, Rocque and Langevin, 2004). This adaptation of legibility could serve as temporary support for those who have big reading difficulties (insufficient knowledge of the French language, severe learning disorders, illiterates, mild intellectual disabilities, etc.).

- Ex. «le bateau blanc avance sur l’eau» become «le bateau blanc avance sur l’eau».

- Sound version (SV): this modality is not an innovation. It is simply a question of adding the sound recording of a Web page text then the user can activate it at will. VS can be combined to the three other modalities.

**Softwares of Support for Text Adaptation**

To this day, these four modalities were put in trial in experiments limited to some users. The data collected let glimpse a) a high efficiency of these modalities with the target clientele, and b) a very high costs of application of the first three modalities ST, AO and PS. That is why we develop software of support for the text adaptation:

- Simpliphrase (phase 1): for the simplification of sentences.
- Simplitexte (phase 2): for the simplification of text.
- Transposeur OA: for the automatic transposition to alternative ortograf.
- Ajout Sph : for automatically adding a phonetic support to a text.

The efficiency of that software to reduce the costs of application of the modalities will be estimated during the works planned by the next two strategies.

**Adaptation of Books for Pupils in Serious Learning Difficulties of the Reading**

The pupils who still do not know how to read after the first two years of elementary school are in serious difficulties. Deprived of literate skills, they cannot read to learn and they quickly accumulate a major delay of the learning at the elementary school and, once to the secondary, they become at high risk of dropping out.

In partnership with publishing houses, this third strategy aims to supplying the pupils
with textbooks and adapted books during, if necessary, each of their last four years to the elementary school. The adapted version of a book would present the same page opening, the same subjects and the same illustrations on the same pages as the original version, but texts would be adapted. It would be to the relatives and to the teacher of the pupil to order the adapted textbook in the version which would correspond most to its needs:

- Simplified text
- Simplified text with phonetic support
- Simplified text transposed in alternative orthography

**Texts Adaptation for Citizen Life**

The means usually used to communicate the information suppose that the citizens are good readers. As we saw earlier, more than half of the citizens have no such skills. In partnership with municipal and community organisms, this fourth strategy aims at supplying adapted texts in documents of information and in Web pages to the citizens with cognitive limitations. Versions in the modalities of adaptation ST, AO and PO would be available for the printed documents, while web pages could in addition, present the option of the sound version (SV).

**Studies of Impact**

There are prerequisites in the large-scale use of these modalities of text adaptation. As highlighted in the second strategy, it is necessary to reduce at first their costs of application. It is also necessary to evaluate their impact on the target population. From 2009 till 2012, we plan to lead several projects of evaluation of impact out of which the two more important are:

- Study of impact on adapted textbooks
- In September 2009, about twenty pupils of 3rd year of the primary who will still be at the b-a-b of the learning of the reading will receive textbooks adapted accordingly to the modality chosen by their teachers and their relatives. Every subsequent year, they will receive, if necessary, adapted textbooks of a more advanced level, while their former adapted textbooks will be handed to 20 other younger pupils. We shall study the impact of adapted textbooks on the pupil (learning of the reading, the self-respect), on its integration in the pedagogic activities in the class, as well as on the evolution of their plan of intervention. At the end of this study, we will have the data spread out over four years for the first troop of 20 pupils, over three years for the second, over two years for the third and over one year for the last one.

- Study of impact on adapted texts concerning the accessibility to information and on the citizen participation
  During four years, we shall study the impact of adapted texts used by municipal services and community organisms on the accessibility to information and on citizens' self-representation among the target population.

**Ultimate Condition**

A reduction in the cost of application of the text adaptation modalities and the convincing results further to the studies of impact could lead to the large-scale use of these modalities by the school circles and by the public and community organisms. There is however another condition without which these adaptations have no chance to be established. They would indeed need to be accepted or at least tolerated by the rest of the population.

**Reaction of the Citizens to the Implantation of the Modalities of Accessibility on the Site of the City of Montreal**

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Since 2005, the City of Montreal made a commitment in the way of the universal accessibility. The Group DEFI Apprentissage worked together with associative partners to develop an accessible version of the Web site of the City of Montreal. Known under the name "AccèsSimple", this version offers three modalities of simplification which are: the Simplified Text, the Alternativ Ortograf and the Sound Version. The site was inaugurated April 5th, 2005 and raised an important reaction in the media and from certain citizens of the city. Indeed, 378 e-mails were received between April 6th and May 14th, 2005. The analysis of the arguments which conditioned the positive or negative appreciation of AccèsSimple allowed us to bring to light two related themes of criticism. The unfavourable reactions (80 %) were much more numerous than the favourable reactions (13 %). These last ones were generally the ones from persons implicated with the target population, who were delighted at the offered accessibility. The unfavourable reactions, as for them, were especially uttered under two main arguments: a rupture from the spelling foundations and the negation of citizen’s status of the persons with cognitive limitations. It is interesting to underline that the first logic of arguments testifies mainly of the fact that these citizens did not take into account the fact that the version alternative ortograf was aimed at a group of citizens who, without this adaptation, cannot read. Instead of an adaptation intended for a specific population, certain Internet users saw a proposition of modification of the written language intended for all the population and thus, of the demonstration of the French written language degradation’s. In the same way that wearing glasses does not question the natural vision, the appeal to cognitive tools does not aim at the population not needing this support. The second logic of argument is more problematic in the fact than it denies the legitimacy of a social participation and accessibility to information for the citizens with cognitive limitations.

Conscious of the reactions that such an innovation might provoke, the partners installed a warning appearing automatically during the activation of the version alternative ortograf. This warning specified to whom was intended this version and invited the visitor to make acquaintance with information supplied in an entitled document " Why this site? ". We have to acknowledge that these precautions were insufficient to make the population aware of such an innovation conceived towards invisible limitations. We shall note that two other versions went unnoticed, while they constitute major innovations, especially the one in simplified text. This reaction of the population places in perspective the question of the social choices and the support to the values set in the policies and law adopted by our governments. The community has the choice to grant or not alternative ways to citizens whose skills in reading are such as they are and will be, or almost, always disqualified from the beginning in matters of access to the written information. Knowing that there is one of the alternatives to mitigate their difficulties, are we entitled to neglect this possibility? In order that such technological innovations may be widely adopted by the population, we will not however be able to save ourselves from social debates which will allow to emphasize the social importance of the expected fallout and to enlighten the citizens as for the objectives aimed by their implementation. For example, the stand in favour of such adaptations by important organisms such as the Office des personnes handicapées du Québec (Bureau for the disabled persons of Quebec) and the Association de Montréal pour la déficience intellectuelle (Montréal association for intellectual disabilities) largely calmed the spirits in media.
We believe that it is our duty, as citizens and human beings, to develop innovations to offer the accessibility to information to the outcasts. Also, we are convinced that we have to diffuse texts of information which are drafted in a simple and clear way, even if it is in alternative code or not. The access to information must not be limited to those who know, who have the knowledge and who master the cultural tools.

Finally, opening the door of Web universal accessibility to people facing cognitive disabilities lead us to ask ourselves if e-Learning stakeholders are ready to invest in universal accessibility? And how could e-Learning innovative tools and activities be developed to help this specific population to develop their basic literacy competencies as well as to better participate to our information society?
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Mobile Technology-Assisted English Medical Terminology Teaching to the Students of Medicine

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Abstract

Introduction & Background: In recent years, there has been a phenomenal growth in the number and technical sophistication of what can be termed ‘mobile devices’. In using this term we encompass both the ubiquitous mobile (or cellular) phone and also a range of information processing devices ranging from Personal Digital Assistants (PDAs) to more media-orientated gadgets that play video and MP3 music files. Mobile technology is currently a feasible approach to overcoming many of the obstacles in current methods of EFL reading instruction.

Objective: The paper studies the role of mobile technology (m-technology) in medical terminology learning for the students of medicine. Medical terminology is a complementary part of English for Medical Purposes (EMP) course for the students of medicine at English as Second Language (ESL) context universities. In this study, using Short Message Service (SMS), m-technology was integrated into web-based learning for the students of medicine. This study examined students’ experiences of m-technology used at Kashan University of Medical sciences in Iran.

Method & Material: A brief description of the system as well as the trial that took place is presented. Forty students were involved in the study. Both quantitative and qualitative statistical methods were adopted through assessments using an online test system and a questionnaire sent by email to collect data.

Findings & Conclusion: The research findings show significant improvements in the learner performance and in their attitudes towards using m-technology in their medical terminology learning. With holistic pedagogical curriculum design, effective learning may come about independent from time and space by a hybrid adoption of m-technologies and other digital technologies even without the use of complicated technological design.

Keywords: Mobile Learning, English as a Second Language, Medical Terminology, Web-based Learning.

Introduction

In recent years, there has been a phenomenal growth in the number and technical sophistication of what can be termed ‘mobile devices’. In using this term we encompass both the ubiquitous mobile (or cellular) phone and also a range of information processing devices ranging from Personal Digital Assistants (PDAs) to more media-orientated gadgets that play video and MP3 music files. Mobile Learning is defined as the teaching and learning processes through the use of mobile and handheld devices such as cell phones, PDAs, laptops, and tablet PCs (Qingyang 2003). According to Chabra and Figueiredo (2002), “M-Learning is the ability to receive learning anytime, anywhere, and on any device.” Hence, the mobility factor is the
ultimate means of providing M-Learning services to the students or teachers. M-Learning usually adopts a web-based system due to its compatibility and flexibility of reaching out more users with different requirements and capabilities.

Mobile technology is currently a feasible approach to overcoming many of the obstacles in current methods of EFL reading instruction. Standing on the shoulders of the giant, CALL (Computer Assisted Language Learning, e.g., Barker & Torgesen, 1995; Mioduser, Tur-Kaspa, & Leitner, 2000; Speziale & La-France, 1992; Sung, Huang, & Chang, under review), mobile assisted language learning (MALL) has the capability of providing EFL learners with the same opportunities for independent and targeted reading practice and immediate corrective feedback as CALL. In recent years, many studies have explored new methods of language learning made possible by the unique features of MALL, including portability, social interactivity, context sensitivity, connectivity, individuality, and immediacy (Attewell & Webster, 2004; Chinnery, 2006; Klopfer, Squire, & Jenkins, 2002; Soloway et al., 2001). Research suggests that MALL has excellent potential for providing students with rich, real time, collaborative and conversational experiences both in and outside the classroom. However, the focus of MALL is mostly on speaking (Kukulska-Hulme, 2005), vocabulary (Thornton & Houser, 2005), phrases (Thornton & Houser, 2005; Morita, 2003), and grammar (Sung, Huang, & Chang, 2006), rather than early reading skills.

Some pedagogical tools in an m-Learning context offer valuable possibilities:

- Multiple choices questionnaire “true/false”, “fill-in the blanks” exercises with
- responses via SMS.
- Listening to a text read by vocal service, followed-up by a quiz to practice
- understanding.
- Recording of a vocal sequence with a play back to practice accent.
- Grammatical explanation via vocal service.
- Interactive scenario involving multiple participants for a “real-life” experience
- Reference services with added value, such as dictionary (definition, synonyms, and antonyms) or translation service (word, phrase), etc. These services might be effectively delivered using simple technologies such as SMS or vocal systems.

The paper reports on a small pilot study that explores the role of mobile technology (m-technology) via Short Message Service (SMS) combined with web-based technology in English as second language (ESL) medical terminology learning for the students of medicine. M-technology is developing very quickly, adding features and converging technology applications into a mobile, wireless handheld environment. A host of m-learning research findings have showed that m-technology bears the unique characteristics of immediacy, expediency, interactivity and flexibility (Chang, 2003) and has relatively cheap ongoing costs (Soloway et al 2001). M-technology affordances (Conole, 2003) allow learners to remain connected and learners no longer need to be constrained by specific time and place restrictions. Students have the potential to locate learning materials and contact fellow learners or tutors “just-in-time”. In other words, “m-learning (e-learning
using mobile devices and wireless transmission)” (Hoppe, 2003) can happen wherever learners are free to participate and whenever they want or need to. Therefore, m-technology is considered to be a promising device for collaborative and constructive learning (Zurita, 2004) teacher training (Seppälä, 2003) and even a test administration option (Hoppe, 2003).

However, m-learning is “often associated with a simplistic understanding of facilitating learning by delivering learning content” regardless of the highly valued “active, productive, creative and collaborative learning methods” in modern education and pedagogy (Ibid). Roschelle (2003) further points out that mobile device educational application take an overcomplicated view of technology and a simplistic view of the social practices surrounding these applications. Complicated non-compatible designs of m-technology without scale for feasible pedagogical applications are problems to be confronted and resolved. As a starting point, this research uses relatively simple m-technology to ensure easy adaptability in a pedagogical environment.

Young (2004) contends that web-based learning is beneficial to learners in that it makes education accessible to a range of learners who can make the most out of “anytime, anywhere learning”. However, with wired web-based learning, anytime, anywhere learning is hard to achieve. Moreover, even though wireless web-based learning is possible, due to the limitations of m-technologies such as small screen size, limited storage and unstandardized platform amongst various mobile devices, m-learning alone for some program is not desirable. However, research into technology merging and the use of different combinations of technologies in different contexts have produced some promising results. For instance, m-learning and game-based learning by itself is not unique, the combination of the two kinds of learning could help reshape conventional learning and provide powerful new opportunities for students (Facer, 2004).

Accordingly, this small pilot study, integrating m-learning via SMS into web-based instruction, is an attempt to move in such a direction, taking English vocabulary learning as the content area.

Research Methodology & Project Design

Groot (2000) examined a set of theories that attempted to address how the mental lexicon is structured and how it operates, and proposes that we learn best when there is gradual acquisition of new words through repeated exposure in a wide range to authentic contexts. Groot (2000) points out, normally, there is not enough time for appropriate exposure to new words of the same intensity as in first language acquisition and that there is no easy solution to this difficulty. The most realistic approach is to create an environment that is most conducive to learning new words, by striking a balance between frequency of exposure and a range of contexts offered for the new words (Asgari Arani, 2007). Therefore, the designed program in this study put an emphasis on presenting the features and functions of vocabulary-in-context (Nation, 1990) on the web and audio is provided for both the texts and medical terminology to expose the students of medicine to a multi-model input. In addition, new terms and expressions are delivered through SMS twice a day based on the assumption that reviewing words of a foreign language at spaced intervals may facilitate long-term memory storage (Thornton, 2005). There are four topics for medical terminology, namely, skin, muscular system, skeleton, and senses. Each topic has four days learning content with learning resources of On-line Dictionary, Vocabulary Tips and medical Tips for the students to refer to. New terms and expressions sent on the mobile phones
through SMS and on the web, have, basically, the same content except that explanations of vocabulary in SMS messages are shorter than those on the web due to SMS limitations of some mobile phones, allowing only 160 letters to be sent each message. However, shorter messages may not be a disadvantage in learning. According to Thornton and Houser’s (2005) research findings, both short and long messages for English as a foreign language vocabulary learning via mobile e-mail produce similar results though further investigations are claimed to be made.

E-mail asynchronous computer mediated communication was designed for communication between students and the tutor and among students themselves. In addition, students are also suggested to communicate with their friends via SMS. The course lasted four weeks. Two forms of learning content, namely, web-based learning content and SMS messages of new words and expressions were delivered synchronously on a daily basis. Learners were expected to finish studying one topic in four days both by visiting the web-materials and by reading the new words and expressions received on their mobile phones through SMS. On the next day, the learners were expected to review the content learned during the previous four days on the website. They also received all the new terms and expressions in the previous four days through SMS to reinforce their learning. On Saturday, a Self-check was prepared for the learners as an ongoing assessment to evaluate what they had learnt during the week. They were also recommended to refer to the resources section on the website.

Project Evaluation Procedure

Warm-up assessment as pre-test and My achievement assessment as post-test were collected at both the beginning and end of the study in the recorded system on the website in order to check whether there were improvements in the learning outcome. Each topic of the UK Memory is followed by a Self-check ongoing assessment (once a week) to consolidate what the learners have learned. There are two parts in Selfcheck, with Part One focusing on reading comprehension and Part Two using Multiple-choice close items. A questionnaire containing 7 questions was constructed to elicit the learners’ perceptions about the advantages and disadvantages of integrating m-learning into web-based medical terminology learning. The questionnaire was distributed to all the learners through email.

Results: Qualitative & Quantitative

In order to examine whether or not there were initial significant improvements in the learner’s instructional terminology learning compared with their pre-learning, measures of central tendency (means and standard deviations) were compared and correlated t-tests were conducted on data obtained from assessment results of the Warm-up and My-achievement assessments in the on-line test system. Tables 1 and 2 summarize the results obtained. Though the standard deviations for each of the indicators (Mark and Time) in Tables 1 and 2 show that there is a wide range of distribution of scores or time variability in both Warm-up (One, Two & Total) and My-achievement (One, Two & Total) assessments, there are marked differences between Warm-up and My-achievement assessment means of both Mark and Time test results, which indicates a marked improvement in the scores of My-achievement assessment over those in Warm-up assessment. Also the learner’s performances were higher though less time was taken to complete My-achievement assessment (Part one, Part two and Total). The wide range of Mark and Time distribution may be due to the differences in personal factors such as age and language proficiency. In terms of Mark and Time t-test values, in Warmup assessment, the t-test values are not significant in general.
However, the t-test values on My-achievement scores are very significant, which indicates a substantial improvement in scores in My-achievement assessment (One, Two & Total).

<table>
<thead>
<tr>
<th>TEST TYPE</th>
<th>MEANS</th>
<th>T-VALUE</th>
<th>P-VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warm-up 1</td>
<td>49.90</td>
<td>-4.507</td>
<td>0.001*</td>
</tr>
<tr>
<td>My-achieve 1</td>
<td>75.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Warm-up 2</td>
<td>53.00</td>
<td>-3.068</td>
<td>0.013*</td>
</tr>
<tr>
<td>My-achieve 2</td>
<td>77.60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Warm-up Total</td>
<td>109.20</td>
<td>-4.228</td>
<td>0.002*</td>
</tr>
<tr>
<td>My-achieve Total</td>
<td>151.00</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Statistically Important T-Test

<table>
<thead>
<tr>
<th>TEST TYPE</th>
<th>MEANS</th>
<th>T-VALUE</th>
<th>P-VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warm-up 1</td>
<td>353.70</td>
<td>-4.587</td>
<td>0.147</td>
</tr>
<tr>
<td>My-achieve 1</td>
<td>247.50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Warm-up 2</td>
<td>431.67</td>
<td>-2.516</td>
<td>0.033*</td>
</tr>
<tr>
<td>My-achieve 2</td>
<td>255.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Warm-up Total</td>
<td>798.78</td>
<td>-1.903</td>
<td>0.105</td>
</tr>
<tr>
<td>My-achieve Total</td>
<td>533.11</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Statistically Important T-Test

Regarding correlations between Time and Mark in the same test, and Time or Mark in different assessments, there are no statistically significant differences in any of the assessments, indicating that those who performed highest on the Warm-up assessment might not score the highest on My-achievement assessment. In addition, those who performed highest might not take less time in doing the tests. The contributing reasons deserve further study. Also, measures of central tendency (means, and standard deviation) and correlations of the four Selfcheck assessments in the UK Memory were examined, but no significant statistics are found. However, the means of scores in the four Self-checks are comparatively higher than those of the Warm-up, which shows that the learners did have some improvement in their whole learning process.

At the end of all the learning activities, the learners completed another questionnaire containing 7 questions to examine the impact of this application on respondents’ medical terminology learning experience.
For these questions, respondents were asked to answer using a Likert scale from 1 (strongly disagree) to 5 (strongly agree). Reliability analysis was carried out to investigate the internal consistency of the scale used in this part of the questionnaire (Crombach’s alpha = 0.92). In particular the increased engagement and interactivity, improved classroom discussions and the ability of lecturer to react to the student’s feedback effectively (Draper and Brown, 2004). The expectation was that English as-second-language (ESL) students would find the system more useful than native English speaking students would. This assumption was based on the idea that most of the ESL students would be more comfortable interacting via the SMS channel as it would give them more opportunities to express themselves clearly (Asgari Arani, 2007; Elgort, Marshall, and Mitchell, 2003).

<table>
<thead>
<tr>
<th>STUDENTS’ IDEAS</th>
<th>MEAN</th>
<th>RANK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Using the project during class made the English classes more interesting.</td>
<td>4.04</td>
<td>1</td>
</tr>
<tr>
<td>Using the system increased the levels of linguistic interaction in English class.</td>
<td>4.03</td>
<td>2</td>
</tr>
<tr>
<td>Using the system in the English classroom is a good idea.</td>
<td>3.99</td>
<td>3</td>
</tr>
<tr>
<td>I found this instructional method effective.</td>
<td>3.71</td>
<td>4</td>
</tr>
<tr>
<td>In general, I liked using the system as part of EMP course.</td>
<td>3.69</td>
<td>5</td>
</tr>
<tr>
<td>The use of this system during English class enhanced my study.</td>
<td>3.54</td>
<td>6</td>
</tr>
<tr>
<td>The project during class increased my interest in the subject.</td>
<td>3.49</td>
<td>7</td>
</tr>
</tbody>
</table>
Conclusion

The findings of the research test results and questionnaire survey indicate that students and instructors can benefit from the additional channel of learning and teaching in the classroom. The lecturer perceived a gain of quality and quantity of feedback from the students. Students indicated that the system was useful - making classes more interesting and interactive. The system was found to be an especially useful, efficient and preferred method of communication, in comparison to the traditional methods. While students perceived only a moderately positive impact of the system in terms of increasing their interest in the subject and enhancing their study, they indicated that they would nevertheless like to see more use of this technology in the classroom. According to the questionnaire survey, the learners appreciate convenience, connectivity, portability, immediacy and push aspect, which are the attributes of m-technology via SMS. In addition, SMS technology can also work as a reminder and even as a motivator for learning. It should also be emphasized that interactivity was not fully achieved in the learning because of the limitations of SMS technology. However, several limitations of the study should be noted. First, owing to the limited time, technical support, number of subjects involved and the narrow focus of the m-learning project, the results have to be interpreted with caution. It should also be emphasized that interactivity was not fully achieved in the learning because of the limitations of SMS technology. Moreover, it seems that learning would be more contextual if the curriculum was designed to meet working adult learners’ immediate needs. With holistic pedagogical curriculum design, effective learning may come about independent from time and space by a hybrid adoption of m-technologies and other digital technologies even without the use of complicated technological design.
References


Elgort I., S.Marshall,and G. Mitchell,(2003)"NESB Student Perceptions and Attitudes to a New Online Learning Environment, ".


Abstract

The effect of interface design on any learning application in the Internet is based on the task designed by the designer. Communication breakdown between users and machine (computer) happened when users failed to understand the task laid out in the interface design. This could be the result of designers not understanding the importance of human experience and the users who do not understand how machine (computer) operates. Raskin (2000:6) highlighted that “if you want to create a humane interface, you must have an understanding of the relevant information on how both humans and machines operate. In addition, you must cultivate in yourself sensitivity to the difficulties that people experiences”. In other word interface that works is something that is simple. “Given the importance of technology in the lives of young people, it is critical to consider how to create new technologies for children that are easy to use, age appropriate in content and interface, and foster exciting learning experiences in and out of the classroom” (Druin and Hourcade 2005:34). The purpose of interface design is to provide effective communication between learners and the learning system. “Communication technologies are used in education to enhance interaction between all participants in the educational transaction” (Anderson 2004:43). This study focuses on the importance of facilities provided in an online learning in Classnetwork.net to the user’s online success skills. The importance of facilities is measured through the correlational values with the users’ online success skills and the number of hours that users access the online content. This study also intends to examine the effectiveness of task provided in the facilities in order to achieve the users’ objective in terms of accessibility and information retrieval. A sample consisted of 148 teacher education students who enrolled in various teacher education programmes is used to evaluate the content delivered through Classnetwork.net. This study will report on the effectiveness of the facilities according to the users’ online success skills. It will also report on the relationship between the numbers of hours the users spend to retrieve the content in Classnetwork.net and their understanding of the content.

Keywords: Online learning, Online delivery system, Communication technology through effective interface design.

Introduction

Teaching online is a formal educational process in which some or all of the instructional interaction occurs when students
and instructors are not in the same place. There is nothing new about this because The University of Chicago began teaching correspondence courses by mail in the 1880's, and the BBC has run the TV-based Open University in England since the 1960's. Online instruction, however, allows teachers and students to communicate and interact, and thus has significant advantages over previous delivery methods.

Online teaching includes web-based instruction, teaching with the internet, distributed learning, and the online classroom. Using World Wide Web (WWW) for teachers and students seems to be common nowadays. Terminologies for using WWW for teaching and learning in broader terms, that have been used in online learning, are e-learning, internet learning, distributed learning, virtual learning, computer assisted instruction (several examples by Ally 2004:4). Online learning can be defined as the use of internet to access learning materials; to interact with the content, instructors and other learners and to obtain support during the learning process, in order to acquire knowledge, to construct personal meaning and to grow from the learning experience (Ally 2004:4).

Teaching online has unique advantages and challenges: "Creating a distance learning course involves more than replicating familiar classroom strategies in a different form. Distance education "requires a different approach - one that focuses less on the amount of time students spend together in a particular place, and more on facilitating a distance community and on activities designed for students working individually."

(University of Washington (UW) 2004). These succinct "ideas" introduced by UW are excellent, experience-based suggestions for building online community, increasing participation, facilitating communication, and enhancing the use of chat rooms, discussion boards, etc. in online courses. A recent development combines both modes of instruction into "hybrid" courses, which meet part face-to-face, and part of the time online.

Seven Principle for Good Practice in Undergraduate Education mentioned following good practices on online delivery:

1. Encourages Contacts between Students and Faculty
2. Develops Reciprocity and Cooperation among Students
3. Uses Active Learning Techniques
4. Gives Prompt Feedback
5. Emphasizes Time on Task
6. Communicates High Expectations
7. Respects Diverse Talents and Ways of Learning (Zelda & Chickering 1987)

Revisiting the article in 1996 and 2008, Chickering and Ehrman write: "Since the Seven Principles of Good Practice were created in 1987, new communication and information technologies have become major resources for teaching and learning in higher education. If the power of the new technologies is to be fully realized, they should be employed in ways consistent with the Seven Principles." The essay describes some of the most cost-effective and appropriate ways to use computers, video, and telecommunications technologies to advance the Seven Principles. Online teaching includes teaching strategies, content sequencing, interaction and assessment activities. Table 1 outlines five (5) aspects of an online course.

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appropriate ways to use computers, video, and telecommunications technologies to advance the Seven Principles. Online teaching includes teaching strategies, content sequencing, interaction and assessment activities. Table 1 outlines five (5) aspects of an online course.

Table 1 Delivery Modes Matrix (Center of Learning Technologies, Faculty Orientation and Resource, 2005)

<table>
<thead>
<tr>
<th>Online Course</th>
<th>Pedagogical model</th>
<th>Content Presentation</th>
<th>Access to Course Content</th>
<th>Interaction</th>
<th>Assessment and Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Short lectures can be recorded to present critical and important concepts. Instructors can promote active learning by engaging students, requiring/promoting interaction and small group activities. Instruction is often more controlled by student interest, and the instructor plays the role of facilitator. Specify learning activities requirements and expectations. Learning activities should promote reflection, interaction, collaboration and deep learning.</td>
<td>Syllabus, reading, study guides, activities, mini-lectures, assignments, etc., are posted in Blackboard. Content are presented and shared using various formats: text, images, audio and video. Flexible navigation: instructor/ student-led. Effective online courses require a combination of paced and un-paced, synchronous and asynchronous activities.</td>
<td>Accessibility (pace and depth) and flexibility (media type) of content provide a higher learner control. Students are more active participants in the learning process. Access to course content and interaction is available via in-class activities as well as online activities via Blackboard.</td>
<td>Interaction is conducted through online tools such as threaded discussion (asynchronous) and chat (synchronous). Creating and maintaining dynamic learning communities require advanced planning, clear goals, guidelines and expectations. Provide multiple opportunities for sharing ideas and opinions and higher learner-to-learner interactivity.</td>
<td>Alignment of assessment criteria and methods with stated learning outcomes. Clear goals, expectations, guidelines and grading criteria or rubric. Assessment can be used to reinforce learning by providing further in-depth explanations of difficult concepts; provide diagnostic feedback; evaluate students progress, etc. Homework, quizzes, exams, projects, etc. are typically used to assess students. Proctoring might be an issue. Timeliness of feedback: automated responses.</td>
</tr>
</tbody>
</table>


**Literature Review**

This section introduces our review of literature that is closely related to our study. It focuses on thinking skills, online skills, learner success skills and cognitive load.

**Learning through World Wide Web**

Online learning can be defined as the use of internet to access learning materials; to interact with the content, instructor and other learners and to obtain support during the learning process, in order to acquire knowledge, to construct personal meaning and to grow from the learning experience (Ally 2004:4). World Wide Web is one of the popular platforms for teachers and instructors to deliver their content. Students who are exposed to internet have more options either to be fully dependent or independent in their learning activities. When both teachers and students are connected to internet they can interact with each other through various
channels such as email, blog etc. Teaching and learning through WWW provide more choices for teachers and students in choosing their own strategy.

Using World Wide Web (WWW) for teachers and students seems to be common nowadays. Terminologies for using WWW for teaching and learning in broader terms that have been used in online learning are e-learning, internet learning, distributed learning, virtual learning and computer assisted instruction (several examples by Ally 2004:4).

**Online Success Skills and Thinking Skills**

University of Central Florida (UCF) (2005) as in “Research Initiative for Teaching Effectiveness”, among others mentioned the following strategies for succeeding in online courses.

- Students provide the following advice for those considering online courses:
- Keep up and don't procrastinate
- Attend the orientation
- Be disciplined
- Develop your computer skills
- Ask for help
- Keep in touch with the professor
- Check the forum daily

Study conducted by University of Central Florida (UCF) (2005) stated that majority of the students are satisfied with their experience using fully online course and were positively on taking another fully online course. In line with this statement the needs for our students in Universiti Brunei Darussalam to use online course due to their needs to access their resources whenever they need it. More than 80% of the faculty members in UCF are satisfied with their experience teaching Web or Web-enhanced course. Their satisfaction is based on quality of interaction. Positive aspect of Web teaching include structure and time convenience, increased student outreach and contact, personal satisfaction, availability of expanded research tools, improved course management, and the ability to learn new technologies. However the challenge is when dealing with technical problems and lack of student engagement. Most of the faculty members (87%) changed their approach to teaching as a result of their online teaching experience that include responding more to student needs, changing their course development and delivery, incorporating technology into teaching, modifying their time management, and utilizing an increased amount of resources in their courses.

Concerning “The Role of Critical Thinking in the Online Learning Environment”, Bruning (2005) mentioned that critically reflective learning provides students with an opportunity to evaluate concepts learned and apply them to their experiences, contemplating its affect on future learning. This process occurs in a learning community where student interaction and feedback fuels the learning process leading to a higher level of critical reflective thinking for the learner. The challenge for online instructors is how to incorporate critical thinking in the online environment in an effective manner. The author addresses the issue of critical thinking and how it is applied in an actual online environment through an interactive exercise created by the instructor. The exercise not only fuels student learning but also creates a learning community in which students interact and share ideas. The BUS105 Create-A-Problem exercise described in her paper incorporates critical thinking in the online environment to meet the goals of developing reflective critical thinking in students and to nurture and online learning community that can be used as a model for other online instructors.

Bruning (2005) in her article above mentioned about learning challenges and issues of critical thinking in the online learning. The challenge to the instructor was
to develop a course that provided the fundamental knowledge on the concepts. The second was to provide usability and functionality in navigating the course. The instructor wanted to reinforce concepts but was faced with the challenge of how to post questions to the discussion board and encourage interaction with other learners. Five core general education learning outcomes in all classes are summarized as follows:

- The ability to problem solve.
- The ability to communicate with other learners.
- The ability to use the English language in communication.
- The ability to read and summarize.
- The ability to apply critical thinking concepts to course concepts.

The challenge to the instructor was to gain an understanding of the online learning platform and to think of ways to incorporate the educational learning outcomes as possible. Two specific areas needed special attention: establishing interaction among students and implementing critical thinking. Critical thinking is defined as the ability for the student to use independent thinking and incorporate concepts learned to problem solve a realistic situation. The unique challenge of incorporating the outcomes in the online learning environment is the lack of face-to-face communication and real time conversation. Since students in the online platform work independently through the computer technology medium, the instructors needed to create a way to promote interaction among students similar to group learning in the face-to-face course.

Definitions for critical thinking are one of the issues worth mentioning here. In general, critical thinking is the method of evaluating arguments or propositions and making judgments that can guide the development of beliefs and taking necessary actions, in this case, in using the Internet. Critical thinking can also be seen as important educational tasks. As a process, critical thinking involves students in recognizing and researching the assumptions that undergird their thoughts and actions. When students think critically, they start to research these assumptions for the evidence and experiences that inform them. Thinking involved information and information need to be transferred effectively to the recipient so that they can use it effectively to fulfill any of their teaching and learning needs. Information involved knowledge, some of the knowledge need to be filtered to maintain its relevancy to the recipient’s needs. The recipients (learners) should have specific skill in filtering, manipulating, digest and synthesize the information provided in the medium such as WWW. Higbee (1977a:45) in discussing about association in relation to memory stated that “association refers to taking materials you want to learn and relating it to something you already know”. So in digesting information learners should find appropriate strategy in linking the material in WWW from their experience.

“Thinking has been defined as the process involved in manipulating information, either collected through the senses or stored in memory from previous experience so as to be able to respond to the immediate situation” (Malim,1994:138). Smith (1990:2) stated that “thinking involves mentally representing some aspects of the world and manipulating these representation or beliefs so as to yield new beliefs, where the latter may aid in accomplishing goals”.

The problem of guidance from the teachers in their teaching and learning occurs when their students are not ready with their information beforehand. However even though they are ready with their information (course material) but “they lack analyzing and synthesizing skills”.(Raja Maznah Raja Hussain, Abdullah Mohd Noor and Zahari Hamidon, 2008:6). As
supported by Watson (2005) who cited Shilwant and Haggarty (2005) stated that “without experience or other guidance, most learners- of all ages are not adequately prepared to learn effectively from technology-rich training offered by organizations. As a result, the training investment in high-tech delivery systems and coursewares are not regularly achieving their potential impact on learner’s performance”. Learner’s readiness plays an important role in making their learning activity successful. The use of internet technology in teaching and learning provides challenges to teachers. Anderson (2004:35) stated that “online learning can present challenges to educators, because the tools and opportunities for discovering students’ preconceptions and cultural perspective are often limited by bandwidth constraints”. Teachers should think a new way of interacting with their students and at the same time, students should be ready with not only information but also specific skills in digesting the information (such as downloaded lecture notes) in order to achieve their learning objectives.

Zahari, Abdullah and Andy Azhar (2008:13) concluded that “the proportion of online activities to offline activities is highly depending on pedagogical and the operational preferences of the higher institutions. Pedagogical refers to the types of activities that best used in the course and what level of assessment that could be accomplished for the particular group of undergraduates. Blended learning involves the types of activities, content planning, and the role of teaching staffs in overseeing the online process”.

Interface Design and Learning Environment

Access Time

Access time is defined as time allocated by the student themselves to search and use internet resources for benefit of their learning objectives. Fiaz Hussein & Jefferies (1998:363) reported that “72 percent of their highly literate computer students wanted less than a fifth of the course to be delivered via the internet, with only 2 percent who desired the entire subject module available online”. Another section in their report stated that (pp.363) “some students have actually commented that they spend so long downloading things from the Internet only to find that is not actually what they require and because of this they have now decided not to use the Internet. One reason for the relatively poor retrieval times is the trend for developers to embed images, animation, audio and (in some cases) video within their home pages”.

Bandwidth seems to be one of the major problems in most institutions who want to implement online learning. McGreal & Elliot (2004:115) stated that “Multimedia on the Internet is still not an everyday reality in same sense as multimedia in CD-ROM or DVD, which may be common place in home or classroom. Internet connection speeds limit the quality and quantity of what can be transmitted. Even with wired/wireless and high speed advances, the transmission of large sound, animation and video files can be time-consuming and frustrating”.

Learning Time

Learning time can be established through time allocated to the student and their willingness to spend the time for their learning activity. Instructors should consider two important factors; 1) actual time spend and 2) time needed by the students to determine their degree of learning (Ritchey 1986:76). So in designing the interface for online learning, designers should consider numbers of task to be laid out and their access time. “The time actually spent is a function of two variables. First is the opportunity to learn, the time which is allocated for the students to learn.
The second aspect is the perseverance of the students. This is the time the students willing to spend on the learning activity” (Carrol, cited in Ritchey 1986).

Learning time may affect the learner’s memory in terms of storing it. Higbee (1977:36) has given a good example on forgetfulness among learners, who stated that “slow learners and fast learners do not differ in their rate of forgetting if the slow learners are allowed more time to study the material originally so they can learn it as well as fast learners”. He added (p. 36) “it is the degree of learning rather than the rate of learning that is critical in rate of forgetting. Similarly, meaningless material may take longer to learn than meaningful material”.

Cognitive Load Theory

“During instruction, the extent to which extraneous cognitive load (ECL) presents students with a problem mainly depend on the intrinsic load (IL). If intrinsic load is high, extraneous cognitive load (ECL) must be lowered, if intrinsic load (IL) is low, a high extraneous cognitive load (ECL) due to inadequate instructional design may not be harmful, because the total cognitive load (CL) is within memory limits” (Merreinboer & Ayres, 2005:8)

Learning through World Wide Web (WWW)

Higbee (1977b:37) stated that the “basic principles on which learning and memory are based include: meaningfulness, organization, association, visualization, attention, interest and feedback”. Perhaps we can consider these factors prior to organizing contents in WWW. Using World Wide Web (WWW) for teachers and students seems to be common nowadays. Terminologies in using WWW for teaching and learning that have been used in online learning are e-learning, Internet learning, distributed learning, virtual learning and computer assisted instruction (Ally, 2004:4). Materials that are organized in WWW should

be in line with the way on how the learners think. Higbee (1977b:43) stated that “the more consciously organize material at time of recording, the easier it is to retrieve”. It seems that unorganized material in WWW will affect the long term memory because “material is also organized in long-term memory” (see Higbee, 1977 pp. 42)

Objective of the Study

The aim of the study is to observe and examine the effectiveness of the interface design provided in classnetwork.net in applying the “online success skills” (Watkins & Corry, 2004) and thinking skills in line with the students’ study areas, their access time and their understanding of the content materials. It will also examine whether the students are able to achieve the learning objective while accessing classnetwork.net through the facilities provided in the interface design in line with their access time and thinking skills.

Research Questions

1. Does the interface design in Classnetwork.net able to fulfill the online success skills?
2. Can the student use Classnetwork.net as their thinking tool?
3. Does the access time affect the learner’s success skills?

Methodology

A sample of 148 students from various study programs who registered in three educational technology courses is asked to access Classnetwork.net from anywhere, any place within 14 weeks. In this period respondents are expected to download their course material, analyze and digest it prior to lecture. After 14 weeks, a survey questionnaire is disseminated to respondents for feedbacks on items as listed in Figure 1. Correlation is used to determine the effect of the interface design on online success skills (OSS). If both items
are closely related then either it is negative or positive, it has given an effect to each other. Wiersma (1995:348) stated that “the correlation coefficient is used extensively as a descriptive statistic to describe relationship between two variables. It is also used for prediction the estimation of one variable from knowledge of another variable”.

**Instrument**

The items in the instrument are designed to gain data on demography, Online Success Skills (OSS) and Learner’s Success Skills adapted from Cory and Watson (1990), Performance data adapted from Rubin (1994), Basic Computer Skill and Internet Access facilities.

**Evaluating Interface Design**

Interface design is evaluated by using usability study technique. The respondents are asked to give feedback in a survey questionnaire based on the items adapted from Rubin (1994). Items adopted from Rubin (1994:157) are used to gain performance data from the users. It consists of four items in Time Duration and two items in Counts and Rates. Rubin (1994:156) stated that “performance data consists of objective measure of behavior, such as error rates, time measure and counts of observed behavior elements”

![Fig 1. Interaction between students, computer (interface design) and WWW](image)

**Findings**

**Demography**

One hundred and forty eight respondents completed the survey instrument, comprising of 42 males (28.4%) and 106 females (71.6%)

<table>
<thead>
<tr>
<th>Gender</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>42</td>
<td>28.4</td>
</tr>
<tr>
<td>Female</td>
<td>106</td>
<td>71.6</td>
</tr>
<tr>
<td>Total</td>
<td>148</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Table 2 Respondents according to gender
Table 3 reports the distribution of gender according to their working experience. Majority of respondents shows no experience in both gender with 20 males (47.6%) and 42 females (39.6%), followed by respondents with 1-5 years teaching experience comprises of 10 males (23.8%) and 24 females (22.6%), 11-15 years experience with 6 males (14.3%) and 9 females (8.5%), 6-10 years experience with 3 males (7.1%) and 18 females (17.0%), 20-25 years experience consists of 2 males (4.8%) and 8 females (7.5%), 16-20 years experience with 1 male (2.4%) and 4 females (3.8%), only 1 female (0.9%) reported have 25 years and above working experience.

Table 3 Working experience according to gender

<table>
<thead>
<tr>
<th>Working experience</th>
<th>Gender</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
<td></td>
</tr>
<tr>
<td>1-5 yrs</td>
<td>10</td>
<td>23.8%</td>
<td>24</td>
</tr>
<tr>
<td>6-10 yrs</td>
<td>3</td>
<td>7.1%</td>
<td>18</td>
</tr>
<tr>
<td>11-15 yrs</td>
<td>6</td>
<td>14.3%</td>
<td>9</td>
</tr>
<tr>
<td>16-20 yrs</td>
<td>1</td>
<td>2.4%</td>
<td>4</td>
</tr>
<tr>
<td>20-25 yrs</td>
<td>2</td>
<td>4.8%</td>
<td>8</td>
</tr>
<tr>
<td>25 yrs above</td>
<td></td>
<td>1</td>
<td>9%</td>
</tr>
<tr>
<td>No experience</td>
<td>20</td>
<td>47.6%</td>
<td>42</td>
</tr>
<tr>
<td>Total</td>
<td>42</td>
<td>100.0%</td>
<td>106</td>
</tr>
</tbody>
</table>

Table 4 shows a distribution of n and percentage of respondent’s area according to gender. Majority of respondents came from value-based area of study comprising of 21 males (50.0%) and 56 females (52.8%) followed by language-based with 13 males (31.0%) and 34 females (32.1%). Other areas were information technology with 1 male (2.4%) and 2 females (1.9%), skill-based with only 1 male (2.4%), concept-based with only 3 females (2.8%) and respondents with no specific study area with 6 males (14.3%) and 11 females (10.4%).

Table 4 Respondent’s study area by gender

<table>
<thead>
<tr>
<th>Area</th>
<th>Gender</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
<td></td>
</tr>
<tr>
<td>Language-based</td>
<td>13</td>
<td>31.0%</td>
<td>34</td>
</tr>
<tr>
<td>Concept-based</td>
<td></td>
<td>3</td>
<td>2.8%</td>
</tr>
<tr>
<td>Information Technology</td>
<td>1</td>
<td>2.4%</td>
<td>2</td>
</tr>
<tr>
<td>Value-based</td>
<td>21</td>
<td>50.0%</td>
<td>56</td>
</tr>
<tr>
<td>Skill-based</td>
<td>1</td>
<td>2.4%</td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>6</td>
<td>14.3%</td>
<td>11</td>
</tr>
<tr>
<td>Total</td>
<td>42</td>
<td>100.0%</td>
<td>106</td>
</tr>
</tbody>
</table>

Research Question 1. Does the interface design in Classnetwork.net able to fulfill the online success skills?

In this study, online success skills show respondent’s readiness to use WWW as their learning platform. The result shows that most
of the respondents have very high skills. The average of skills stated by respondents were browsing (M = 4.02, SD = .71), download (M = 3.96, SD = .70), searching (M = 3.96, SD = .75), communication (M = 3.65, SD = .78), Access (M = 3.63, SD = .83), Compare (M = 3.60, SD = .71) and synthesize (M = 3.30, SD = .79).

Table 5: Online Success Skills

<table>
<thead>
<tr>
<th></th>
<th>Min</th>
<th>Max</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Browsing</td>
<td>1.00</td>
<td>5.00</td>
<td>4.0203</td>
<td>.71400</td>
</tr>
<tr>
<td>Download</td>
<td>1.00</td>
<td>5.00</td>
<td>3.9595</td>
<td>.69867</td>
</tr>
<tr>
<td>Searching</td>
<td>1.00</td>
<td>5.00</td>
<td>3.9595</td>
<td>.74577</td>
</tr>
<tr>
<td>Communication</td>
<td>1.00</td>
<td>5.00</td>
<td>3.6486</td>
<td>.78129</td>
</tr>
<tr>
<td>Access</td>
<td>1.00</td>
<td>5.00</td>
<td>3.6284</td>
<td>.82710</td>
</tr>
<tr>
<td>Compare</td>
<td>1.00</td>
<td>5.00</td>
<td>3.6014</td>
<td>.71657</td>
</tr>
<tr>
<td>Synthesize</td>
<td>1.00</td>
<td>5.00</td>
<td>3.3041</td>
<td>.78817</td>
</tr>
</tbody>
</table>

Compared to online success skills, learner’s success skills although it shows above average but it’s a bit lower than most of the online success skills. The result shows that most of the respondents have a high skill. The average of skill stated by respondents was study habit (M = 3.78, SD = .81), taking notes (M = 3.74, SD = .67), effective reading (M = 3.68, SD = .71), time management (M = 3.64, SD = .67), critical thinking (M = 3.54, SD = .72) and test taking (M = 3.51, SD = .63).

Table 6: Learner’s Success Skills

<table>
<thead>
<tr>
<th></th>
<th>Min</th>
<th>Max</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study habit</td>
<td>1.00</td>
<td>5.00</td>
<td>3.7770</td>
<td>.80661</td>
</tr>
<tr>
<td>Taking notes</td>
<td>2.00</td>
<td>5.00</td>
<td>3.7432</td>
<td>.67129</td>
</tr>
<tr>
<td>Effective Reading</td>
<td>2.00</td>
<td>5.00</td>
<td>3.6824</td>
<td>.70986</td>
</tr>
<tr>
<td>Time management</td>
<td>2.00</td>
<td>5.00</td>
<td>3.6419</td>
<td>.67016</td>
</tr>
<tr>
<td>Critical thinking</td>
<td>2.00</td>
<td>5.00</td>
<td>3.5405</td>
<td>.72260</td>
</tr>
<tr>
<td>Test taking</td>
<td>2.00</td>
<td>5.00</td>
<td>3.5135</td>
<td>.63339</td>
</tr>
</tbody>
</table>

Table 7 shows a distribution of mean of items in Intrinsic Cognitive Load (ICL). The results are found to be above average. The findings shows that most of the interface design facilities provided in the web pages can facilitate student’s need in term of “interaction between them and the materials within their level of expertise” (Merreinboer & Ayres, 2005:6).
Table 7 Intrinsic Cognitive Loads

<table>
<thead>
<tr>
<th></th>
<th>Min</th>
<th>Max</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interactivity facility able to ease me in performing the task laid out in the</td>
<td>1.00</td>
<td>5.00</td>
<td>3.8243</td>
<td>.75337</td>
</tr>
<tr>
<td>interface</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The nature of the material have assist me in defining the task laid out in the</td>
<td>2.00</td>
<td>5.00</td>
<td>3.9392</td>
<td>.65180</td>
</tr>
<tr>
<td>interface</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Numbers of interface design element have influence me a lot in performing the task</td>
<td>1.00</td>
<td>5.00</td>
<td>3.8649</td>
<td>.77940</td>
</tr>
<tr>
<td>provided in the interface</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In Table 8, the users indicated their agreement with only one item between online study skills (OSS) and skills of using the facilities in classnetwork.net. The results shows that item (b) Searching and (4) Time spent reading vs working were negatively strong correlation and is significant, r (148) = -.233, p <.001. Strong positive correlation is shown between item (d) Compare and (6) Less number of omitted steps or procedures with, r (148) = .201, p <.001.

There is also quite strong correlation and is significant shown between item (a) Browsing and (5) Interactive system are low in error with r (148) = .170, p <.001, item (d) Compare and (5) Interactive system are low in error with r (148) = .171, p <.001. Item (e) Synthesize and (5) Interactive system are low in error with r (148) = .198, p <.001, item (e) Synthesize and (6) Less number of omitted steps or procedures, with r (148) = .195, p <.001.
Table 8 Pearson Correlations Coefficient between Online Success Skills and Skills of using facilities in Cassnetwork.net

<table>
<thead>
<tr>
<th>Online Success Skills</th>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
<th>e</th>
</tr>
</thead>
<tbody>
<tr>
<td>Browsing</td>
<td>.059</td>
<td>-.138</td>
<td>.008</td>
<td>.163(*)</td>
<td>.141</td>
</tr>
<tr>
<td>Searching</td>
<td>.474</td>
<td>.095</td>
<td>.923</td>
<td>.049</td>
<td>.089</td>
</tr>
<tr>
<td>Download</td>
<td>.068</td>
<td>.049</td>
<td>-.079</td>
<td>.108</td>
<td>.069</td>
</tr>
<tr>
<td>Compare</td>
<td>.413</td>
<td>.559</td>
<td>.342</td>
<td>.194</td>
<td>.409</td>
</tr>
<tr>
<td>Synthesize</td>
<td>.089</td>
<td>-.139</td>
<td>.002</td>
<td>.075</td>
<td>.019</td>
</tr>
<tr>
<td>Sufficient time to complete a task</td>
<td>.282</td>
<td>.093</td>
<td>.980</td>
<td>.366</td>
<td>.823</td>
</tr>
<tr>
<td>Sufficient time to achieve a criterion level of competence</td>
<td>.004</td>
<td>-.233(**)</td>
<td>-.095</td>
<td>.136</td>
<td>.133</td>
</tr>
<tr>
<td>Sufficient time to recover from an error</td>
<td>.964</td>
<td>.004</td>
<td>.252</td>
<td>.100</td>
<td>.109</td>
</tr>
<tr>
<td>Interactive system are low in error</td>
<td>.170(*)</td>
<td>.071</td>
<td>.076</td>
<td>.171(*)</td>
<td>.198(*)</td>
</tr>
<tr>
<td>Less number of omitted steps or procedures</td>
<td>.040</td>
<td>.391</td>
<td>.357</td>
<td>.038</td>
<td>.016</td>
</tr>
</tbody>
</table>

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

The findings yield two important results:

1. Interface design elements in Classnetwork.net can facilitate student who used it to compare information. The students have sufficient time to complete the task laid out in the content page due to its low error (as stated in item (5) Interactive system are low in error and longer attention span on each display(as stated in item (6) Less number of omitted steps or procedures).

2. Some of the skills of using interface (predictor) seems to affect some of OSS in browsing, searching, compare and synthesize skills. This shows that the interface design facilities are in line with the user’s skills in using the interface, hence they are able to browse, search, compare and synthesize effectively.

**Research Question 2. Can the student use Classnetwork.net as their thinking tool?**

Most of the items that are closely related to ‘association’ (Higbee, 1977), manipulating information (Malim, 1994) and manipulating representation (Smith, 1990) are ‘compare’ and ‘synthesize’ in Online Success Skills and ‘critical thinking’ in Learners Success Skills.

Table 4 shows that students are able to compare information (M = 3.60, SD = .72), they also able to synthesize information (M = 3.30, STD = .79). Concerning learners success skills (Table 5), students are able to critically
use the information in their learning activity (M = 3.54, STD = .72)

The findings yield 3 results:
1. In Online Success Skills, students are able to compare and synthesize information while using Classnetwork.net in their learning activity
2. Traditionally, in Learner Success Skills, students are able to critically use the information in their teaching and learning.
3. Classnetwork.net can be used as a thinking tool due to its ability to “deliver the content in line with the way of the student’s thinking” (Higbee, 1977:43).

**Research Question 3. Does the access time affect the learner’s success skill?**

**Access Time**

Access time is measured through access of internet by students at home and university. Seven categorical data are sorted out as shown in Table 9. It shows the distribution of access time to internet at home and university by students. The findings show that most of the students spend more time to access internet at home as compared to the university. 64 students (43.2%) spend their time accessing internet at home within 3-4 hours. 56 students (37.8%) did not spend any of their time accessing internet at the university. As a whole, most students seem to spend most of their time accessing internet at home compared to the university.

<table>
<thead>
<tr>
<th>Hours use computer at home</th>
<th>n</th>
<th>%</th>
<th>Hours use computer at University</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 hrs above</td>
<td>23</td>
<td>15.5</td>
<td>3</td>
<td>2</td>
<td>2.0</td>
</tr>
<tr>
<td>7-9 hrs</td>
<td>12</td>
<td>8.1</td>
<td>1</td>
<td>0.7</td>
<td></td>
</tr>
<tr>
<td>5-6 hrs</td>
<td>35</td>
<td>23.6</td>
<td>9</td>
<td>6.1</td>
<td></td>
</tr>
<tr>
<td>3-4 hrs</td>
<td>64</td>
<td>43.2</td>
<td>25</td>
<td>16.9</td>
<td></td>
</tr>
<tr>
<td>1-2 hrs</td>
<td>12</td>
<td>8.1</td>
<td>54</td>
<td>36.5</td>
<td></td>
</tr>
<tr>
<td>none</td>
<td>2</td>
<td>1.4</td>
<td>56</td>
<td>37.8</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>148</td>
<td>100.0</td>
<td>148</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

Table 10 shows frequency and percentage numbers of access to Classnetwork.net by the students within 14 weeks (one semester) learning time. Most of the students accessed Classnetwork according to their needs (n = 102, 69%).
Table 10- Access Classnetwork.net

<table>
<thead>
<tr>
<th>Frequency</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>never</td>
<td>2</td>
<td>1.4</td>
</tr>
<tr>
<td>once a week</td>
<td>20</td>
<td>13.5</td>
</tr>
<tr>
<td>Twice a week</td>
<td>22</td>
<td>14.9</td>
</tr>
<tr>
<td>Everyday</td>
<td>2</td>
<td>1.4</td>
</tr>
<tr>
<td>According to my needs</td>
<td>102</td>
<td>68.9</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>148</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Figure 2 shows number of hits by the students registering in four courses through Classnetwork.net. The finding shows an average of 442 hits for 10 months in using Classnetwork.net within 10 weeks learning time. The highest hit was in August 2008 with 985 hits.

Figure 3 shows number of hits by the students in Course Page (Educational Technology Page) within 9 months. The result shows an average of 131.56 hits for 9 months access period. The highest hit was in August 2008 with 299 hits. The trend shows that the students had frequent access to the course page after August 2008.
Figure 4 shows a weekly access to classnetwork course page (Educational Technology Page) within 9 week from 21 September – 16 November 2008. The result shows an average of 41.67 hits for 9 weeks access period. The highest hit was on week 8 (9 – 15 November) with 91 hits. The hits had increased since in week 4 and drop drastically after week 8.

Watkins (2005:1) stated that “two essential skills for success in e-learning are adapting old skills (learner success skills) and apply it in new e-learning skills (online success skills)”

As stated in Table 5 Learner’s success skills, the results showed that most of the students had high skills in learner’s success skill (LSS). Most of the items in both Table 4 and 6 showed mean above 3.0. The highest mean in LSS is Study habit (M = 3.78, SD = .81) and the lowest is Test taking (M = 3.51, SD = .63), while in OSS the highest mean is Browsing (M = 4.02, SD = .71) and the lowest mean is Synthesize (M = 3.30, SD = .78). Some of the skills in OSS are likely scored higher as compared to LSS except Synthesize. The result shows that the students are able to adapt the “old skills and habits from traditional classroom for use in e-learning and developing and applying new e-learning skills and habits for e-learning” (Watkins, 2005:1)

Table 11 shows the Spearman Correlation of Time spend on internet at home and university versus learner’s success skills. In this case learner’s success skill is the criterion variable and time spends on internet at home and university as a predictor. The results showed that all coefficients had weak correlations except for effective reading and hours use of computers at the university. Two items were positively correlated and is significant, r (148) = .162, p < 0.01. Overall the coefficient is very small, showing almost no correlation and not significant.
The conclusions that can be drawn from the results are:

1. Time spend on internet either at home or university represent the access time has not affected most of the items in the learner’s success skills except for effective reading \( r (148) = .162, p < 0.01 \) and taking notes \( r (148) = -.141, p < 0.01 \)

2. As a whole, according to statistic provided in Yahoo!, the students started accessing Classnetwork.net in March 2008 while the semester starts in February 2008. The student accessing Clasnetwork.net whenever they feel free to do so. Table 13 shows most of the students spend more time accessing internet at home compared at the university. So the actual time students are likely to access Classnetwork.net is a month after starting a lecture. That is where they are likely to actively participate in browsing, downloading materials and Blog discussion. In November 2008, students seemed to be quite active in accessing Classnetwork.net to update their materials and participate in Blog discussion. The Blog is closed on 17 November, 2008. Within 14 weeks learning time the students seemed to be active accessing Classnetwork for only 8 weeks (March – November 2008).

3. If we measure the findings with Carrol Model (Richey 1986), the actual time needed by the students is 10 weeks while the actual time for the students to spend is 14 weeks. Results in Table 3 shows most of the students prefer to access Classnetwork.net according to their needs \( n = 102, 68.9\% \). Despite of other distraction such as doing other task in any other courses, 13.5\% \( n = 20 \) of the students used classnetwork.net once a week and 14.9\% \( n = 22 \) twice a week. This shows that the students are willing to spend their time at least 10 times in 10
weeks to access Classnetwork.net and the most is 20 times in 10 weeks.
Conclusion

Interactive reading and writing via online networks presents an unprecedentedly new pedagogy that is only now being acknowledged for the real depth of unique educational merit it deserves. Very little research on online teaching exists, despite widespread interest. The promise of online teaching is that both teachers and learners can be anywhere, participating at any time convenient, through any type of microcomputer with modem. If online instruction can demonstrate economies of delivery of distance learning, it opens the door to ongoing learning for all potential learners. No one is too old or too young to be both learner and teacher. "Community networking" and "lifelong learning" are two related themes pointing the direction forward (Odasz 2008).
References


Old Dominion University (2005), “Preparing and Teaching Online Course: Delivery Modes


IMS-LD Analysis under the Angle of Systems Engineering

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King Saoud University, Riyadh, Saudi Arabia

Abstract

IMS Learning Design constitutes a formal framework for representing learning situations. It has caused since its appearance an important number of critical analyses. However these analyses results are still difficult to conjure or conciliate in absence of a common perception of the design’s product (OLS: Online Learning System) and the design itself. To palliate to this problem, we propose in this paper a new analysis approach of the IMS-LD specification which wants to be global, interdisciplinary and uniform. This approach founded on the hypothesis: “an OLS is perceived as a technical system” based on the optic of systems engineering. Thus, we launch a new thinking way about IMS-LD aiming to boot up research efforts under the angle of systems engineering.

Keywords: Learning Design, IMS Learning Design, Systems engineering, Analysis.

Introduction

The emergence of Information Technologies for teaching (ITT) has revealed a new learning mode called « e-learning ». It isn’t only about a didactical transposition of « scholar know » to « taught know » but an interdisciplinary transposition, according to Balacheff cited in [Labat, 2006-2009], permitting to pass from « know taught » to « learned know». In other words, we pass from a teacher centered approach toward a learner centered approach. Because of the fact, that this learning mode is based on an online access to interactive and sometimes personalized training (on various platforms, in distinct contexts and through a network), it proves to be necessary, in a concern of interoperability and reusability, to use the learning design. This necessity has engendered a large movement of construction of international standards like IMS Learning Design (IMS-LD) specification. This last proposes a model to represent learning scenarios based not on resources but on activities.

IMS-LD has quickly acquired certain notoriety (Unfold, Ladie, Lornet… [Burgos et al, 2005]) giving rise to the interest of an important number of searchers in the domain. It has been the subject of many analyses work [Pernin, et al, 2005], [Caeiro et al, 2003], [Nodenot, 2006]…, aiming to know its contribution and more particularly its limits [Caeiro et al, 2003], [Marino, Contamines, 2004] and [Nodenot, 2006]. Some of these analyses propose new models or extensions of existing ones [Ferraris et al, 2005] and [Santos et al, 2004]. However, all of them suffer essentially of absence of common perception of the design product, which is the online learning system (OLS), and the design itself, which makes difficult any attempt of conjuration or conciliation of their results. In
order to palliate this problem, we propose in this paper a new approach of analysis of the IMS-LD specification, which wants to be global, interdisciplinary and uniform. This approach, which is founded on the hypothesis that an OLS is perceived as a technical system, is based on the optic of systems engineering. Thus, we launch a new thinking way about IMS-LD aiming to boot up research efforts under the angle of systems engineering [Blanchard and Fabrycky, 1998]. After this introduction, we present in section 2 a general description of IMS-LD specification as analysis object. We go in section 3 through a certain number of existent analyses of IMS-LD specification. The new analysis approach of IMS-LD specification which we propose is presented in section 4. Finally, we show in conclusion the main contribution of this paper and we draw some perspectives.

General Description of IMS-LD as Analysis Object

We describe in this section the IMS-LD specification, which constitutes the object of the different analyses presented in the next section. In 2003 IMS Global Learning Consortium released the IMS Learning Design (LD) specification [IMS]. It is mainly inspired from EMLOUNL (Educational Modeling Language-Open University of the Netherlands), developed in 2001 by R. Koper [Koper, 2001]. It provides a conceptual framework of modeling of a learning unit, centered activity and founded on a theatrical metaphor. The structure of a learning unit is indeed described as a piece of theatre composed of acts, consisting themselves of role-parts associating activities to roles which occur in environment. The principal elements of the conceptual model IMS-LD are: « Activity »; « Role »; « Environment »; and « Method» (figure-1).

![Figure-1: Semantic aggregation levels A, B and C in IMS-LD](http://imsglobal.org/learningdesign/)

**Existential Analyses of IMS-LD**

In this section we present some existent analyses of IMS-LD specification, which we divide into two categories according to their structured or no structured character.

**No Structured Analyses**
These analyses are qualified as adhoc analyses because they don’t use a predefined analysis model. Their results are often difficult to compare with other analyses. A first comprehension of these analyses allows us to extract five analyses dimensions, representing the different aspects of IMS-LD to which they are interested: (1) its theatrical metaphor; (2) its modeling by levels; (3) its generic pedagogical modeling; (4) its formal modeling; and (5) its interoperability. We present below the results of these analyses according the five previous dimensions (figure-2).

![Diagram showing the five analyses dimensions of IMS-LD]

**Theatrical Metaphor**
Structuring and joining objects (activities, roles, tools, …) in IMS-LD follow a top-down approach according to a theatrical metaphor (piece, acts and role-parts), « Top-down – starting with the plays and then working your way down via acts and role-parts to finally the activity structures and activities that were identified as components » [IMS,b].

**Benefits**
- Prescriptive and structured expression of an activity progress [Pernin, et al, 2005];
- Creative and inventive expression [Villiot-leclercq, E., 2006].
- Explicit separation of activities and resources [Caeiro et al, 2003];
- Rationalizing work of the teacher [dessus, Schneider, 2006];
- Static character of the decomposition [Pernin, et al, 2005].
- Exact description of what will happen don’t leave place to the unforeseen [Pernin, et al, 2005];
- Difficulty to adapt or modify a scenario, in real time or a posteriori [dessus, Schneider, 2006];
- Difficulty to foresee all the roles, sub-roles and the interactions between all the actors [Burgos et al, 2005];

**Limits**
- Few precision on granularity of learning units [Pernin, Lejeune, 2004]
- Static character of the decomposition [Pernin, et al, 2005].
- Exact description of what will happen don’t leave place to the unforeseen [Pernin, et al, 2005];
- Difficulty to adapt or modify a scenario, in real time or a posteriori [dessus, Schneider, 2006];
- Difficulty to foresee all the roles, sub-roles and the interactions between all the actors [Burgos et al, 2005];

**Modeling by Levels : A, B, C**
IMS-LD proposes modeling choices at three levels [IMS, a],
1. The A level offers the basic elements permitting the description of the generic learning, appropriate to a set of learners.
2. The B level permits to define learning personalization scenarios, by introducing conditions and properties
mechanisms regarding a role, which could be global or local.

3. The C level permits to envisage different executions of a same learning unit, by introducing the notification concept. A notification corresponds to a started action from the occurrence of a particular event.

**Benefits**
- A certain interest on the organizational plan [Pernin, et al, 2005]. IMS-LD proposes three levels organisation from the more simple and static (Level A) to the more theoretically complex and dynamic (Level C).

**Limits**
- Problems of semantic interoperability between the different levels [Pernin, et al, 2005], [Nodenot, 2006]. Indeed, the levels B and C exploit the conditions which they operate on the properties which are not typed variables. All the semantic is then embedded in the properties and conditions definition and depends of the author;
- Important effort of programming for level C [Pernin, et al, 2005]

**Generic Pedagogical Modeling**
The IMS-LD specification is a meta language [Burgos et al, 2005] as it doesn’t impose a particular pedagogical model.

**Benefits**
- To integrate all the pedagogical approaches and favour the creation of new approaches, so as to prove its flexibility [Burgos et al, 2005] and its extensibility [Griffiths, Blat, 2005];
- To assure the exchange and the interoperability of learning resources and learning units [Pernin, Lejeune, a, 2004].

**Formal Modeling**

IMS-LD offers the possibility to write formally the learning scenario elements.

**Benefits**
- Standardization of teaching [Burgos et al, 2005];
- Rationalization of production [dessus and Schneider, 2006];
- Reutilization of scenarios [Pawlowski, Bick, 2006];
- Precision Increasing of teaching activity and roles of each actor [dessus, Schneider, 2006];
- Capitalization of expertise of scenarization (banks of scenarios) [LICEF].

**Limits**
- Difficulty of manipulation of metadata which wants to be interpretable and interoperable from one platform to another. They are designed essentially for machines and for men [Burgos et al, 2005];
- The activity is a black box [Caeiro et al, 2003], [Nodenot, 2006]. [Nodenot, 2006] declares that in a dilemma between interoperability and expressivity of language, IMS-LD privileges the formal and complete aspect of language to its expression capacity.
- Difficulty of description of activities sequence [Caeiro et al, 2003].
- The functional characteristics of a resource don’t take into account the particular context of the activity to use [Nodenot, 2006]. IMS-LD considers the environment, the resources and the learning objectives as predefined things to which it is basically possible to refer in order to describe a learning activity;
- Few precision on the expertise and the context associated to an activity [Pawlowski, Bick, 2006];
• The problem of description of synchronization points between the activities of tutors and learners [Nodenot, 2006];
• The fact to don’t take into account of interchangeable roles organised in no hierarchical networks [Burgos et al, 2005];
• The difficulty to a priori plan collaborative activities [Ferraris et al, 2005], [Santos et al, 2004], [Marino, Contamines, 2004]

Interoperability
IMS-LD is a PIM (Platform Independent Model), an independent model, which isn’t joined to a particular class of running platform. Indeed it provides a high level conceptual model (UML activity diagram) and a translation into XML which permits the diffusion or the implementation of the model on many platforms.

Benefits
• When choosing the XML technology (eXtensible Markup Language), the IMS consortium shows his desire to be inscribed in the perspective defined by the approach entitled « Semantic Web » centered on problematic of interoperability [14];
• From « Coppercore » as main engine, until « Reload » editor or « Sled » player, crossing a semi dozen of editors. It is easy to see that the instrumentation of IMS-LD is supported by computer science [Burgos et al, 2005].

Limits
• The numerous editors associated to IMS-LD present some limits in terms of adaptability [dessus, Schneider, 2006]

Structured Analyses
These analyses are qualified as structured due to the fact that they repose on a predefined analysis model. Here are three existent structured analyses work:

1. The first [Botturi, al, 2006] entitled « A Classification Framework for Educational Modeling Languages in Instructional Design » shows that the different design languages employed in the domain of pedagogical modeling, among them IMS-LD, present particular dissemblance and capacities. It proposes a classification of languages of pedagogical design as stated by formal aspects and according their potential of usage. This classification permits to evaluate the convenience of a design language to specific projects or situations.
2. The second [Caeiro, al, 2005] entitled «Towards a Benchmark for the Evaluation of LD Expressiveness and Suitability» proposes a set of patterns associated to perspectives to constitute a framework which permits to evaluate the expressivity and the convenience of a language of pedagogical modeling, like IMS-LD. Through this set of perspectives and patterns, the authors try to provide a basic structure which can be again refined to reach an eventual definitive set of criteria, permitting the development of design which maintains principles of reusability and interoperability.
3. The third entitled « Learning systems instrumented with technologies: towards an engineering centered on scenarios » [Pernin, Lejeune, a, 2004] raises a certain imprecision of the IMS-LD specification through a taxonomy of learning scenarios, elaborated from accurately identified criteria (scenario finality, scenario granularity, constraint degree, personalization degree)

Systems Engineering Approach
This section is reserved to present the new analysis approach of IMS-LD, principal result of this article. We explain in a first time, the necessity of the hypothesis to perceive an OLS as a technical system (Systemic perception), then we present the analysis of IMS-LD under the angle of systems engineering.

**Systemic Perception of an OLS**

We consider an OLS as a complex technical system (figure-3). We define below these three notions «System» ; «Technical » ; and «Complex»:

- « A system is a set of interrelated components, forming a complex or unitary whole, working together toward some common objective or purpose » [Blanchadr and Fabrycky, 1998].

- « Technical systems represent all types of human-made artifacts, including technical products and processes. Therefore, the technical system is the subject of the collection of activities that are performed by engineers within the processes of engineering design… » [Blanchadr and Fabrycky, 1998].

- « The complexity of a system is characterized by the important variety of its components and of their specialized functions; their organization at internal hierarchical levels; their no linear interactions; the difficulty and even impossibility to count exhaustively the elements which constitute them; The important variety of possible links between them and the interdependence which relies them [Mélèze, 1972].

An OLS is complex because its realization implies that a certain number of actors (learners, teachers, tutors,...), activities (of learning or support), learning objects (definitions, exercises, examples,...), services (chat, forum, email, …). The assemblage of these different elements forms a complex whole decomposable to its turn in less complex learning units. Accordingly, the systemic approach constitutes the natural and favourable framework of analysis of each OLS. The two fundamental percepts of this approach are the expansionism and the teleology.

- The expansionism considers all the objects and events and all the experiences around them as belonging to greater sets. It doesn’t deny the fact they have parts but it focuses on the sets which they compose. The expansionism has given birth to a thinking mode on the world, a mode of research of comprehension, which is systemic. In this mode the object to study is seen first as a part of a bigger system and is explained in relation to its role in this system. The mode of systemic thinking is qualified as « inside-out thinking ».

- The teleology is interested to goal systems. One isn’t interested to merely mechanical systems only in the case where they are used as instruments of goal systems.

This systemic perception has already been the object of important researches of which we cite principally the following works [Bangou,
IMS-LD Analysis Under the Angle of Systems Engineering

While examining the two previous types of analyses (structured and no structured) presented in section 3, we observe that it is difficult to define an exhaustive set of analysis criteria of IMS-LD specification. It is difficult elsewhere, to conjure or to conciliate their results, in lack of a common perception of the design product, which is the OLS, and of the design which goes with it. Because of the fact that IMS-LD specification is integrated in a more global optic of pedagogical engineering, it must be considered according to a global, interdisciplinary and uniform approach. We propose to adopt the systemic approach (section 4.1), which favors a common and global vision of the OLS, within the engineering context, so the systems engineering.

This analysis approach is characterised by the fact to be:

**Top-down:** it considers the definition of requirements from the system level (OLS) till the components levels and their associating with specific design criteria. Here it is about a characteristic which agrees well with the dimension related to the theatrical metaphor of IMS-LD (section 3.1.1).

**Interdisciplinary and Cooperative:** it integrates the efforts of all required engineering (pedagogy, didactic, computer science, cognitive sciences, psychology, etc.) in the life cycle of an OLS in a coherent whole.

**Hierarchical:** it considers the hierarchy of the whole OLS and the interactions between various levels of this hierarchy which permits to analyze the decomposition in learning units whose requires IMS-LD; the precision of the granularity of this decomposition (method, play, act) varies according to the granularity of the targeted OLS; and the interaction between the elements of the conceptual model of IMS-LD (figure 1).

**Orchestrated** according to a life cycle: it considers all the steps of the life cycle of the OLS [Chikh, 2005], [Sim et al, 2005] from design to utilization (conceptual design, preliminary design, detailed design and development, production and utilization) including the quality, the cost and the users needs. IMS-LD specification is used in the three first steps of this life cycle. Accordingly, it must be analyzed as stated by the requirements of these steps, whose the results have an important impact on the efficacy and the cost of the whole OLS.

**Design for competitiveness:** it assures optimization of the global compromise on the constraints of performance criteria of the OLS by the weighting of associated “design for” since the end of the analysis step. This characteristic permits to take into account the diverse possible orientations of a pedagogical design. Indeed, the design of an OLS supposes to take into account diverse choices of “design for” even conflicting. While progressing towards the concurrent solution, successive decisions are justified by a global analysis of their consequences as well on the OLS itself as on the system which permits to construct it and its environment. Therefore, and in a concern of competitiveness, IMS-LD must precise the choices of “design for” of an OLS. This information will permit to analyse the convenience of a design with IMS-LD as stated by the selected “design for” [Khitri and Chikh, 2008].
**Conclusion**

In this article, we review a certain number of existent analyses of IMS-LD specification. We observe that it’s difficult to conjure or to conciliate their results. Moreover, it is complex to define an exhaustive set of analyses criteria of IMS-LD specification. This report incites us to propose a new analysis approach of IMS-LD specification. This last wants to be global, interdisciplinary and uniform permitting to share a common perception of pedagogical design and the resulting products. Thus, we propose to consider the OLS thinking as a complex technical system. This analysis approach opens new thinking ways about IMSLD aiming to boot up research efforts under the angle of systems engineering.
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Institutional Continuous Improvement through Accurate Learning Outcomes Tracking

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Abstract
Various certification bodies have moved from emphasizing grades and survey results to emphasizing evidence of continuous improvement. This requirement is extremely daunting without the use of technology for accurate tracking of learning outcomes achievement. This paper presents the application of a unique tool in a university environment promoting continuous improvement to become part of the culture. The work emphasizes the usage of enterprise technologies to provide real-time link among various course assessments, respective course learning outcomes, and overall program outcomes. The impact of having continuous data streams and reports of global learning outcomes accomplishment to the various stakeholders is also discussed and demonstrated.

Keywords: e-learning; learning lifecycle management; learning continuous improvement, assessing learning outcomes.

Introduction
Various accreditation bodies are demanding, more than ever, evidence of continuous improvement per stated learning outcome. For example, the Accreditation Board for Engineering and Technology (ABET) states the continuous improvement criteria as one of the key criteria for accreditation [1]. The Southern Association of Colleges and Schools (SACS) states the following as one of the fundamental characteristics of its accreditation: “Accreditation requires institutional commitment to the concept of quality enhancement through continuous assessment and improvement” [2]. Engaging in a learning continuous improvement process that is based on reliable data can very quickly show to be a daunting task given the various elements that contribute to the learning experience. This paper presents the argument that utilization of current technology can allow for the accurate measurement of learning outcomes achievement at various levels, which can feed into a productive and meaningful continuous improvement process. It then presents some results from an experiment conducted at a university department.

Using Technology for Continuous Improvement
Assessing the effectiveness of a training course consists of 4 levels according to [3], which states Kirckpatrick's 4 levels of assessments as follows:

1. Reaction: Where the students satisfied with the class? Obviously this is not a sufficient indicator. An instructor could make the class full of fun scarifying content and learning. Therefore other levels of assessments are needed
2. Knowledge: Did the students learn the material? Students could obtain the knowledge but fail to apply it at work.
3. Behavior: Is the student able to use his training and education to succeed at work? Students could improve their performance at work but collectively fail to cause any impact on the overall performance of the organization or community at large.
4. Impact: Did this training or education generate positive results for an organization or community?

Reliable assessment must eventually touch upon these assessment levels.

The Need for Enterprise Technologies

The complexity of creating relations from the above assessment levels to stated program learning outcomes and the need for technology to address these complex relations is discussed in some details. Mapping these complex needs to advanced Service Oriented Architecture (SOA) characteristics is done. In summary, one needs technology to track the following complex relationships:

1. Identify weakness of a student with respect to a particular course learning outcome of a course
2. Identify weakness of a student with respect to a particular program learning outcome
3. Identify weakness of a course with respect to a particular course outcome
4. Identify weakness of a program with respect to a particular program outcome

The Learning Control Center

Learning Control Center (LCC) is a product offering from Digilore Inc. (www.digilore.com) that started as a research activity with the US Department of Defense (DoD). The product offering allows a learning institution to establish learning outcomes for its programs and courses with ability to create and track extensive relationships among those outcomes. Comprehensive tools are provided to collaboratively create these courses, track their content, and set their own learning outcomes. Mapping tools are then used to map the courses’ learning outcomes to their respective program learning outcomes.

Installation and Planning

LCC was installed at the IT Department within the American University in Dubai on research bases (http://www.aud.edu/Academic_Programs/IT/it_ugrad.asp). The work started with a planning phase. This phase is recommended to be done by a small group that is possibly composed of the program director, the specific area leader(s), and the curriculum developer(s).

The department’s learning outcomes were fed to the tool as shown in figure 1.

<table>
<thead>
<tr>
<th>IT Program</th>
</tr>
</thead>
<tbody>
<tr>
<td>File</td>
</tr>
<tr>
<td>Management</td>
</tr>
</tbody>
</table>

Program Objectives
These are the overall objectives of this particular training program. Indicate how success (students’ learning of the objectives) is measured, by discussing topics, certification, ability to perform a task.

<table>
<thead>
<tr>
<th>#</th>
<th>Program Objective</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Students will have a command of mathematical principles related to logic, relations and Boolean algebra.</td>
</tr>
<tr>
<td>2</td>
<td>Students will know the role of computer technology and tools in facilitating practical solutions in a particular domain.</td>
</tr>
<tr>
<td>3</td>
<td>Students will know how to take on a problem statement and translate it into a practical computer technology solution.</td>
</tr>
<tr>
<td>4</td>
<td>Students will learn to work with other team members in order to create practical computer technology solutions.</td>
</tr>
<tr>
<td>5</td>
<td>Students will gain depth in a particular computing domain, e.g., networking, database, application development, etc.</td>
</tr>
<tr>
<td>6</td>
<td>Students will have competency in professional writing, oral communication, and professional project planning.</td>
</tr>
</tbody>
</table>

Fig1: LCC Learning Outcomes
Various courses that satisfy these outcomes were then specified as shown in figure 2.

To be able to track achievement of program outcomes, the system must learn about the individual course outcomes that inject into each program outcome. Therefore, program and course planners and curriculum developers must identify the learning outcomes for every course. Figure 3 shows the course outcomes that are set for one of the courses.

The course outcomes must now be mapped to the program outcomes shown in figure 1. Figure 4 shows this mapping activity. Doing this for each course creates a comprehensive map from each course learning outcome to various program learning outcomes.
At this stage we have a complete understanding of how various course outcomes are going to allow the program to meet its learning outcomes. We have these relationships maintained within the LCC system to be utilized for assessing achievement.

**Attaching Assessment**

As the delivery of each course takes place, each course is assigned for a faculty (or group of faculty and staff) that will be responsible for setting the content that will allow the course to meet the stated course learning outcomes. It is critical to understand that we are trying to achieve a complete mapping from individual course assessment points to the global program outcomes achievement. Figure 5 demonstrates this goal.

LCC provides the tools that will allow instructors to attach an assessment to a course and map graded components of that assessment to any of the course learning outcomes. This means that the instructor must determine the learning outcomes each assessment is trying to hit on at the assessment creation point. A great advantage...
that is clearly achieved as a result of this process is the change of perspective towards assessment. Prior to this process, grading was a content specific activity. Students’ work was graded with an eye on performing certain tasks in isolation of the outcomes being assessed. Any thought of course learning outcomes achievement occurred after the fact, usually at the end of the course making the outcome assessment highly subjective. Now, placing any assessment in the context of course outcomes is done real-time at the time of assessment creation and is part of the grading activity. Graders are asked to specify the components or pieces of any assessment and map them to course outcomes. They are to grade students’ work per these pieces. Figure 6 shows two pieces of a project of a course and demonstrates the mapping that is taking place for these components to particular course outcomes. In this case the two pieces are being mapped to the first program learning outcome.

The result of the mapping activity shown in figure 4 and figure 6 is a complete achievement of the goal stated in figure 5. The system is now able to provide detailed tracking of student’s achievement at the course and the program levels individually and collectively.

**Learning from the Reports**

Since the system has the complete set of relationships, importing assessment grades into the system allows the system to calculate course outcomes achievement levels and program outcomes achievement levels. This has shown to provide tremendous insight into course progress and hones the course improvement process as well as the program improvement needs. For example, figure 7 shows the mid semester report of a particular course.

![Figure 6: Assessment mapping/each assessment is divided into components that are mapped to individual course learning outcomes. Grading is done per these components](image-url)
The following are immediate advantages obtained from reports similar to the one in figure 7:

1. The professor can easily identify course outcomes that need attention over the remaining portion of the term. Remaining projects, quizzes, etc. can be tuned to reemphasizes these principals.

2. End of term report can easily be used to reflect on the course and improve its next offering by focusing on the course segments that address low scoring outcomes. This will inevitably lead to much focused changes in content (slides, exercises, homework, lab projects, etc.)

3. Outcomes based assessment and evaluation is now part of the daily program activities versus being a process that gets in the way and witnesses increased activities of data collection during accreditation visits and reviews

4. The groundwork is laid for exposing individual students to their learning outcome achievement at the course as well as the program level

5. The collective data from all the course reports are presented by the system in one program level report in terms of program learning outcomes achievement. This is possible because of the existing extensive mapping (refer to figure 5). The faculty members and various committees, e.g. the curriculum committee, now have solid data for directing future improvements hence creating a meaningful continuous improvement process
Conclusion
This paper has demonstrated the use of a powerful IT system to monitor and track a program’s learning outcomes achievement and therefore create an effective continuous improvement process. Relationships among various elements of a program are created in the planning phase. This allows the system during program deployment to track each assessment element to a specific learning outcome, both at the course level as well as the program level. This leads to outcomes based achievement reports that lend themselves naturally to continuous improvement activities in a timely fashion. Some results from a practical implementation were presented.
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Measuring Project-based Hybrid e-Training

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Abstract

This present study is aimed at examining the usefulness of a hybrid e-training module by distinguishing the usefulness of its' content, delivery method, service, outcome and infrastructure. In doing so, the study sought to establish the content validity, test reliability and construct validate factors affecting usefulness of the hybrid e-training approach. Overall reliability coefficients of the instrument examined when analyzed with SPSS 15.0 using cronbach alpha reliability tests were .986 while reliability at the scale levels were also acceptable ranging from .886 to .971. Subsequently external construct validity was conducted by employing structural equation modeling using confirmatory factor analysis (CFA) with AMOS 7.0. Overall analyses suggested that the instrument is valid and reliable to measure the usefulness of a hybrid e-Training module. Internal consistency was still maintained after CFA with overall reliability coefficient of .959 and at the scale level ranging from .814 to .909. A revised model was developed from the hypothesized measurement model with findings showing evidences for external construct validity. Goodness-of-fit measures of comparative fit index (CFI) and non-normed fix index (NNFI also known TLI) were above suggested threshold > .90 (CFI=.943; TLI=.930). The paper will also showcase instructional media used in the study to promote good practice of the problem oriented project based hybrid e-training (POPeYe) orientation.

Keywords: Project based, Hybrid E-Training, Structural Equation Modeling, External Validity.

Introduction

It is evident that in order to progress further into the area of e-Learning, particularly e-Training, an appropriate measurement scale is required. This scale would ideally, distinguish the usefulness of a program in terms of its’ content, delivery method, service, outcome and infrastructure. The aim of this study is to examine the validity and reliability of the Hybrid e-Training Instrument (HiTS) used to measure usefulness of a Hybrid e-training (HiT) module. The module was designed to adopt the problem oriented project based hybrid e-training (POPeYe) orientation in delivering computer and technology courses via various instructional media. The aim is to provide a meaningful e-Training experience by integrating online learning strategy into the regular face-to-face and self-learning method. Constructs of this instrument were adapted from the Demand Driven Learning Model (DDLM) inventory which is a web-based learning model (MacDonald et al., 2001) and evaluation tool developed by MacDonald et al. (2002). DDLM was defined by five key
constructs: Structure, Content, Delivery, Service and Outcomes. The 59-item DDLM inventory were then modified and adapted for HiTS to fit the Asian and local university’s culture. Adaptation was mainly guided by result of interaction and document analysis done during feasibility phase of the study. The first version of the adapted instrument yielded 61 items regarding e-Training for adult learners in a hybrid environment on a Likert-type scale.

**Aim Of The Study**

This paper reports a part of a bigger study. It aims to develop a hybrid e-training instrument (HiTs) to measure hybrid e-training programs, modules or courses. In doing so, the study sought to establish the content validity, test reliability and construct validate factors affecting usefulness of a hybrid e-training module implemented using the problem oriented project based hybrid e-training (POPeYe) orientation. Conclusively, the researchers hope to verify a hypothesized model of hybrid e-training module for Asian trainers/trainees particularly those being the course participants at the institution being studied.

**Research Objectives**

Specifically, the objectives of the study were to (i) establish face and content validity, and then to (ii) determine the reliability and internal consistency of HiTS and finally to (iii) investigate its external validity by developing a revised model of Hybrid e-Training using confirmatory factor analysis.

**Research Question**

Upon establishing the first and second objective of the study as discussed in the following methodology section in section 4, the study was then guided by the following research question to achieve the third objective:

“Is trainee’s perspective towards usefulness of the module’s content, delivery, service, structure and outcome?”

**Origin of the Hybrid E-Training Framework: The Demand Driven Learning Model**

The origin of the hybrid e-training (HiT) framework which was developed in this study, was from a credible model, the Demand-Driven Learning Model (DDLM) by MacDonald et al. (2001). DDLM has a companion evaluation tool (MacDonald et al. 2002) to design and evaluate an online course or module. The DDLM development required collaboration between academics and experts from commercial, private and public industries. The goal of utility and currency of the model was built onto the development process; an early draft describing the DDLM was presented to a panel of industry experts which includes representatives from highly respected national and international commercial organisations including Nortel Networks, Alcatel, Lucent Technologies, Cisco Systems, Arthur D. Little Business School, Learnsoft Corporation, Lucent Corporation, and KGMP Consulting Services (Breithaupt & MacDonald 2003). These groups represent a sampling of the most influential and innovative Canadian stakeholders in on-line technology and education field. This group reacted with enthusiasm and interest in implementing the DDLM and tool in their operations.

The DDLM is a model of web-based learning designed for working adult learners. As mentioned in the introduction section, the model is defined by five key constructs: Superior Structure, Content, Delivery, Service and Outcomes. Superior Structure can be viewed as standard of high quality attained only by online programs that meet specific requirements. These requirements may be predicted by excellence of Content, Delivery, Service and Outcomes. The dynamic
relationship between DDLM constructs is presented graphically as in Figure 1.

![Diagram of the Demand Driven Learning Model (DDLM)](image)

**Fig-1: The Demand Driven Learning Model (DDLM)**


In the DDLM framework, high quality content is considered to be comprehensive, authentic/industry-driven and researched. In relation to the content, high quality delivery is defined as delivery that carefully considers usability, interactivity and tools. The DDLM defines high quality service as service that provides the resources for learning as well as any administrative and technical support needed. Such service is supported by skilled and emphatic staff that is accessible and responsive. High quality programs provide outcomes such as personal advantages for learners with lower cost to employers while achieving learning outcomes. The publication and dissemination of findings on DDLM-based programs contribute to theory and practice hence on-going evaluations will ensure longevity and validity of the structure standard proposed. A consequence of the evolution of operational definition of the components in the DDLM is the need to adapt and improve the model and of course, the evaluation effort should include measurement of learning objectives specific to the program being evaluated (MacDonald et al. 2001).
Conceptual Framework of the Hybrid E-Training Module

In this current study, the target group is computer trainers/trainees. They need to develop teaching methods, curricula, media and materials to meet differentiated learner needs. Based on 24 open ended student evaluation findings from 4 cohorts of postgraduate Computer Education students (2003-2004), interaction analysis of 616 electronic forum postings and literature reviews, various e-Learning models particularly the Demand Driven Learning Model (DDLM) by MacDonald et al. (2001), a conceptual Hybrid e-Training framework was designed and used as a framework to design and deliver the course starting the year 2005. Formative evaluations were conducted and various improvements take place until we decided on the final platform that was used in the final implementation phase in February 2008. The design of the course had taken into consideration that it will be implemented using what the researchers name a Problem Oriented Project Based Hybrid e-Training (POPeYe) orientation.

Training courses were implemented within the use of a hybrid combination of face-to-face, self-learning and computer mediated communication to ensure learners have the opportunity to actively interpret their experience using internal, cognitive operations via the practice of reflective exercises embedded into their blogging project. Task analysis was conducted to identify the most needed course content to be focused on. The findings were later presented to a group of experts and refined to only three main subtopics. Two instructional media, the computer education blog (Figure 2) and a new Computer Training Delivery course handbook (Figure 3) was then developed for the hybrid course.

Fig-2: One of the Postings in the Course Blog at http://rosseni.wordpress.com
The course handbook and the blog had gone through expert and heuristic review by educational technology experts. Subsequently, seven additional e-Training courses on Technology for Thinking/Instruction were conducted for various groups of computer trainers/trainees. A total of 212 respondents were involved from February to July of 2008. Data analysis was done using SPSS 15 and Amos 7.0 (Arbuckle, 1997) to test for reliability of the instrument and seek internal consistency and external validity using the conventional alpha cronbach test and structural equation modeling. These procedures were done to verify items and constructs and eventually to come up with the Hybrid e-Training Instrument (HiTs) and a verified model for the Hybrid e-Training (HiT) module.

![Fig-3: The cover of Handbook for Computer Training Delivery Course: Instruction](image)
The conceptual framework of HiT may be presented graphically as in Figure 4. It includes the five components of DDLM (MacDonald et al., 2001; 2002) where items under each component or constructs were modified accordingly to suit Malaysian qualification framework (MQF) requirements. This was translated into the Handbook for Computer Training Delivery. As for the computer education blog, knowledge management (KM) components were embedded into its design. KM is a concept in which an organization consciously and comprehensively gathers, organizes, shares, and analyses its internal knowledge in terms of resources, documents, and people skills. Marquadt (1996) divide KM system into four subsystem that is (i) knowledge acquisition – activity involving scanning the environment within and outside the organization for information and knowledge (explicit and tacit), (ii) knowledge creation – enables us to process and analyze information through the use of various tools, (iii) knowledge storage – involve the nerve in the knowledge management system that enables learners/trainers/trainees/employees to retain and retrieve knowledge and data bases and (iv) knowledge transfer and utilization subsystem that allows information and knowledge to be disseminated and shared.
This study involves a knowledge management system that gathers, organizes, shares and analyses its internal knowledge in terms of web resources, electronic and print medias, and archives of articles and online seminars conducted in current and previous training courses using the computer education blog to link up to various learning management systems and a localized computer mediated communication (CMC) system. The current
KM system consists of the course blog that is linked to the university’s Learning Management System (LearningCare) provided by the Computer Centre and the wordpress open source blogging platform

**Problem Oriented Project Based Hybrid E-Training Orientation**

Problem Oriented Project Based Hybrid E-Training Orientation (POPeye) traces back to 1970’s in Denmark when Aalborg University and Roskilde University Center were established (Dirckinck-Holmfeld, 2002). In Denmark, the more popular term for POPeeye is Problem Oriented Project Pedagogy (POPP). Today POPP or POPeeye can to some extent be compared to problem-based learning (PBL) and case-based learning which both are internationally applied. According to Dirckinck-Holmfeld (2002), to a certain degree, these approaches built on the same constructivist learning principles as POPP or POPeeye; however there is a fundamental difference related to the point of departure for the learning process. PBL takes its point of departure in the solution of pre-defined task or problem set by the teacher or the textbook or modules (Pettersen 1997 in Dirckinck-Holmfeld 2002). Therefore, this learning process is more governing than the POPeeye or POPP-approach, which emphasizes learning as principally ungovernable.

The framework of this study uses POPeeye as a means of providing active, constructive, authentic, achievable learning objectives that provides meaningful learning. In order to create contents for a meaningful learning that are appropriate to user needs yet fulfill the Malaysian qualification framework in line with the POPeeye orientation, task analysis was conducted to determine content and instructional media to be use for the computer training delivery course as explained in section 4.1 (Table1) and 4.2 (Table 2). With the advent of knowledge-economy, embracing the concept of knowledge management (KM) for life long learning (LLL) as the foundation of a learning society takes priority because people will have to continuously update their knowledge and skills to maintain a competitive edge in the global economy (Sharifah Hapsah, 2003).

MQF provides the structure for actualizing LLL because it facilitates learners to select learning pathway most appropriate for them. Thus, a response was made to create an academic culture capable of producing learners with qualities ranging from competencies in soft skills, intellectual qualities and affective attributes, aside from the typical technical and professional skills (Committee of Deputy Vice Chancellors and Rectors of Malaysian Higher Learning Institutes, 2006). This response is embedded in the course outline within the computer training delivery handbook and the learning matrix is shown as in Table 3.

**Task Analysis for the Computer Education Course Content**

In order to come up with appropriate content for the course, previous course participants were ask to rate the probability of them applying the knowledge acquired in their future teaching and learning plans. A total of 50% (12) - 100% (24) of the respondents said ‘yes’ to the probability of them using the knowledge in their teaching and learning. However, for one subtopic (Computer Applications in the Teaching of Science and Mathematics in English), only 25% (6) of the respondents said they will use the knowledge. All the six respondents are Science or Mathematics teachers and the rest teaches computer and/or other subjects. As a result, this subtopic has been taken out from the face to face curriculum and posted to the portal as a self-study e-learning module intended for those who are interested, especially the Science teachers.

Respondents were also ask to rate the subtopics in terms of the consequences of
incompetence in certain area/subtopic. Four scales were provided starting with not significant (0 marks), significant (1 mark), serious (2 marks) and disastrous (3 marks). The average rating for twenty nine of the subtopics were significant while one subtopic, ‘instructional design’ received an average rating of ‘disastrous’. The respondents were also asked to rate the importance of each subtopics. Four scales were provided starting with not relevant (0 marks), not important (1 mark), important (2 marks) and critical (3 marks). Thirteen subtopics received an average rating of important while the other sixteen subtopics received an average rating of critical. One subtopic were rated ‘serious’, one were rated ‘disastrous’ while the rest were rated ‘significant’ if incompetent in the subtopic. However, all subtopics received a high rating of either important or critical. As a result, all significant subtopics that received a rating of ‘significant’ and ‘important’ will be delivered online while all ‘critical’ subtopics will be delivered face-to-face with additional activities to be delivered online no matter if it received a rating of significant, disastrous or serious as a consequence of incompetence.
Table-1: Task analysis for Computer Education Content

<table>
<thead>
<tr>
<th>Content</th>
<th>Time (min)</th>
<th>Probability of use</th>
<th>Consequences of incompetence</th>
<th>Importance</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Foundation of Computer Education:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Computer in Education**</td>
<td>30 (OL)</td>
<td>100.0% (24)</td>
<td>Significant</td>
<td>Important</td>
</tr>
<tr>
<td>Computer Integration in T&amp;L**</td>
<td>30 (OL)</td>
<td>100.0% (24)</td>
<td>Significant</td>
<td>Important</td>
</tr>
<tr>
<td>Computer Applications in the Teaching of Science and Mathematics in English**</td>
<td>30 (OL)</td>
<td>25.0% (6)</td>
<td>Significant</td>
<td>Important</td>
</tr>
<tr>
<td>Computer Mediated Communication**</td>
<td>30 (OL)</td>
<td>95.8% (23)</td>
<td>Significant</td>
<td>Important</td>
</tr>
<tr>
<td>Learning Organization*</td>
<td>30 (OL)</td>
<td>95.8% (23)</td>
<td>Significant</td>
<td>Important</td>
</tr>
<tr>
<td>Teaching Methods and Strategies**</td>
<td>60 (Hyb)</td>
<td>75.0% (18)</td>
<td>Significant</td>
<td>Critical</td>
</tr>
<tr>
<td>Facilitator Skill*</td>
<td>60 (Hyb)</td>
<td>100.0% (24)</td>
<td>Significant</td>
<td>Critical</td>
</tr>
<tr>
<td>Effective Computer Training Delivery**</td>
<td>30 (OL)</td>
<td>100.0% (24)</td>
<td>Significant</td>
<td>Critical</td>
</tr>
<tr>
<td>10. Instructional Design **</td>
<td>60 (Hyb)</td>
<td>100.0% (24)</td>
<td>Significant</td>
<td>Critical</td>
</tr>
<tr>
<td></td>
<td>50 (F2F)</td>
<td>100.0% (24)</td>
<td>Disastrous</td>
<td>Critical</td>
</tr>
<tr>
<td><strong>Learning Theories:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Behaviorism**</td>
<td>30 (OL)</td>
<td>100.0% (24)</td>
<td>Serious</td>
<td>Important</td>
</tr>
<tr>
<td>Constructivism**</td>
<td>90 (Hyb)</td>
<td>95.8% (23)</td>
<td>Significant</td>
<td>Critical</td>
</tr>
<tr>
<td>Cognitivism**</td>
<td>30 (OL)</td>
<td>58.0% (14)</td>
<td>Significant</td>
<td>Important</td>
</tr>
<tr>
<td>Adult Learning*</td>
<td>25 (F2F)</td>
<td>92.0% (22)</td>
<td>Significant</td>
<td>Critical</td>
</tr>
<tr>
<td>Situated Learning**</td>
<td>30 (OL)</td>
<td>58.0% (14)</td>
<td>Significant</td>
<td>Important</td>
</tr>
<tr>
<td>Contextual**</td>
<td>30 (OL)</td>
<td>58.0% (14)</td>
<td>Significant</td>
<td>Important</td>
</tr>
<tr>
<td>Anchored Instruction**</td>
<td>30 (OL)</td>
<td>58.0% (14)</td>
<td>Significant</td>
<td>Important</td>
</tr>
<tr>
<td>Human-Computer Interaction**</td>
<td>30 (OL)</td>
<td>92.0% (22)</td>
<td>Significant</td>
<td>Important</td>
</tr>
<tr>
<td>Minimalist**</td>
<td>25 (F2F)</td>
<td>100.0% (24)</td>
<td>Significant</td>
<td>Critical</td>
</tr>
<tr>
<td>Experiential Learning**</td>
<td>30 (OL)</td>
<td>92.0% (22)</td>
<td>Significant</td>
<td>Critical</td>
</tr>
<tr>
<td>Cognitive Load**</td>
<td>25 (F2F)</td>
<td>92.0% (22)</td>
<td>Significant</td>
<td>Critical</td>
</tr>
<tr>
<td>Cognitive Flexibility**</td>
<td>30 (OL)</td>
<td>58.0% (14)</td>
<td>Significant</td>
<td>Critical</td>
</tr>
<tr>
<td><strong>Learner Differences:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Multiple Intelligences**</td>
<td>50 (F2F)</td>
<td>92.0% (22)</td>
<td>Significant</td>
<td>Critical</td>
</tr>
<tr>
<td>Personality**</td>
<td>50 (F2F)</td>
<td>100.0% (24)</td>
<td>Serious</td>
<td>Critical</td>
</tr>
<tr>
<td>Learning Style**</td>
<td>50 (F2F)</td>
<td>100.0% (24)</td>
<td>Significant</td>
<td>Critical</td>
</tr>
<tr>
<td>Cognitive Style*</td>
<td>60 (OL)</td>
<td>100.0% (24)</td>
<td>Significant</td>
<td>Critical</td>
</tr>
<tr>
<td><strong>Computer Skills:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Internet &amp; e-Learning**</td>
<td>60 (Hyb)</td>
<td>100.0% (24)</td>
<td>Serious</td>
<td>Important</td>
</tr>
<tr>
<td>WeBlogging*</td>
<td>60 (Hyb)</td>
<td>100.0% (24)</td>
<td>Significant</td>
<td>Critical</td>
</tr>
<tr>
<td>Web Construction**</td>
<td>60 (Hyb)</td>
<td>100.0% (24)</td>
<td>Significant</td>
<td>Critical</td>
</tr>
<tr>
<td>Hard Disk Maintenance*</td>
<td>30 (OL)</td>
<td>100.0% (24)</td>
<td>Significant</td>
<td>Important</td>
</tr>
<tr>
<td>5. Multimedia Applications**</td>
<td>180 (OL)</td>
<td>100.0% (24)</td>
<td>Significant</td>
<td>Critical</td>
</tr>
<tr>
<td>* suggested for inclusion into new curriculum by past course participants/education expert</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>** covered in current curriculum</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FTF= Face to face interaction</td>
<td>OL = Online Learning</td>
<td>Hyb= A combination of F2F and online learning</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Adapted from Pratt (1980)

**Task analysis for Instructional Media in Computer Education Course**

Task analysis for media use was also conducted to ensure what have been use is suitable to learner needs and what have not been included (may be added if needed).

Results shown in table 2.
### Learning Matrix for the Course

Results from table 1 and 2 were used to develop a course handbook which was presented to one lecturer in the field of Information System, one lecturer in the field of eLearning, one Professor of Education and three Professors that are currently active working on POPP and MQF from Universiti Kebangsaan Malaysia and Universiti Malaya. Learning Matrix was developed and redeveloped based on their comments. Aside from that, a course weblog named Computer Education was developed as in Figure 3.

### Table 2: Task analysis for Instructional Media in Computer Education

<table>
<thead>
<tr>
<th>Content</th>
<th>Current Availability</th>
<th>Probability of use but not compulsory</th>
<th>Consequences of Non-existence</th>
<th>Importance</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Face to Face</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Availability of Power Point presentations*</td>
<td>some</td>
<td>100.0%(24)</td>
<td>Serious</td>
<td>Critical</td>
</tr>
<tr>
<td><strong>CMC and Self Learning</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Availability of Power Point presentations*</td>
<td>some</td>
<td>100.0%(24)</td>
<td>Serious</td>
<td>Critical</td>
</tr>
<tr>
<td>Easy access to electronic articles/journals*</td>
<td>some</td>
<td>75.0%(18)</td>
<td>Significant</td>
<td>Important</td>
</tr>
<tr>
<td>Access to online catalogues*</td>
<td>some</td>
<td>50.0%(12)</td>
<td>Significant</td>
<td>Not</td>
</tr>
<tr>
<td>One-to-one communication (e-mail)**</td>
<td>yes</td>
<td>95.8%(23)</td>
<td>Significant</td>
<td>Important</td>
</tr>
<tr>
<td>Many-to-many communication (e-discussion)**</td>
<td>yes</td>
<td>95.8%(23)</td>
<td>Serious</td>
<td>Important</td>
</tr>
<tr>
<td>Electronic submission of assignments**</td>
<td>yes</td>
<td>25.0%(6)</td>
<td>Significant</td>
<td>Critical</td>
</tr>
<tr>
<td>Electronic submission of project**</td>
<td>some</td>
<td>12.5%(3)</td>
<td>Significant</td>
<td>Important</td>
</tr>
<tr>
<td>Peer review of assignments**</td>
<td>some</td>
<td>100.0%(24)</td>
<td>Significant</td>
<td>Important</td>
</tr>
<tr>
<td>Instructor review of assignments**</td>
<td>yes</td>
<td>100.0%(24)</td>
<td>Significant</td>
<td>Important</td>
</tr>
<tr>
<td>Peer review of project**</td>
<td>yes</td>
<td>100.0%(24)</td>
<td>Significant</td>
<td>Critical</td>
</tr>
<tr>
<td>Instructor review of assignments**</td>
<td>yes</td>
<td>100.0%(24)</td>
<td>Significant</td>
<td>Important</td>
</tr>
<tr>
<td>Electronic reflection*</td>
<td>no</td>
<td>95.8%(23)</td>
<td>Disastrous</td>
<td>Critical</td>
</tr>
<tr>
<td>Electronic portfolio**</td>
<td>yes</td>
<td>95.8%(23)</td>
<td>Disastrous</td>
<td>Critical</td>
</tr>
<tr>
<td>Written exam</td>
<td>no</td>
<td>00.0%(0)</td>
<td>Not significant</td>
<td>Critical</td>
</tr>
</tbody>
</table>

* suggested for inclusion into new curriculum by past course participants/education expert
** covered in current curriculum

Adapted from Pratt (1980)
<table>
<thead>
<tr>
<th>Learning Outcomes</th>
<th>Learning Process</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participants should be able to demonstrate the ability to apply fundamental</td>
<td>Guided student presentation</td>
<td>Lesson plan</td>
</tr>
<tr>
<td>theories and principles of instructional design and meaningful computer training</td>
<td></td>
<td>Teaching media</td>
</tr>
<tr>
<td>delivery.</td>
<td></td>
<td>Teaching method</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Teaching strategy</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Teaching Approach</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pedagogical content</td>
</tr>
<tr>
<td></td>
<td></td>
<td>knowledge</td>
</tr>
<tr>
<td>Participants should be able to apply knowledge and skills in information and</td>
<td>Identify, explore and select</td>
<td>Reflective journal</td>
</tr>
<tr>
<td>communication technology articulately and develop critical thinking, inter-</td>
<td>knowledge from various</td>
<td>Online forum</td>
</tr>
<tr>
<td>personal and communication skills through working in large and small multi-</td>
<td>databases and resources and</td>
<td>Individual/group blogs</td>
</tr>
<tr>
<td>discipline and/or multi-cultural group.</td>
<td>integrates them with prior</td>
<td></td>
</tr>
<tr>
<td></td>
<td>knowledge and experience to</td>
<td></td>
</tr>
<tr>
<td></td>
<td>create and organize new</td>
<td></td>
</tr>
<tr>
<td></td>
<td>knowledge that can be assessed</td>
<td></td>
</tr>
<tr>
<td></td>
<td>by peer and moderators.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Participants will work</td>
<td></td>
</tr>
<tr>
<td></td>
<td>individually or cooperatively</td>
<td></td>
</tr>
<tr>
<td></td>
<td>within their small group to</td>
<td></td>
</tr>
<tr>
<td></td>
<td>design and develop a weblog</td>
<td></td>
</tr>
<tr>
<td></td>
<td>and collaborate with other</td>
<td></td>
</tr>
<tr>
<td></td>
<td>groups to achieve a shared</td>
<td></td>
</tr>
<tr>
<td></td>
<td>goal</td>
<td></td>
</tr>
<tr>
<td>Participants as an autonomous learner and trainer are responsible:</td>
<td>Presentation and workshops</td>
<td>Class participation</td>
</tr>
<tr>
<td></td>
<td>Practical Training/micro</td>
<td>Field work</td>
</tr>
<tr>
<td></td>
<td>teaching/macro teaching</td>
<td>Field report</td>
</tr>
<tr>
<td></td>
<td>Blogging activities</td>
<td>Reflective journal</td>
</tr>
<tr>
<td></td>
<td>Online discussion</td>
<td>Weekly forums</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Participants are to maintain records of activities for critical reflections</td>
<td>Critical reflection</td>
<td>Reflective journal</td>
</tr>
<tr>
<td>and improvement.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Able to do feasibility and need analysis study to identify real world problems</td>
<td>SWOT analysis</td>
<td>An instructional media for</td>
</tr>
<tr>
<td>in media development and come up with a project to solve the problem.</td>
<td>Identification and application</td>
<td>computer training</td>
</tr>
<tr>
<td></td>
<td>of an instructional design</td>
<td></td>
</tr>
<tr>
<td></td>
<td>model</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Problem oriented project</td>
<td></td>
</tr>
<tr>
<td></td>
<td>pedagogy</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Able to identify global trends and suggest a short term curriculum for a</td>
<td>Workshop</td>
<td>An eye-catching brochure</td>
</tr>
<tr>
<td>computer integrated course at a competitive price yet able to break-even.</td>
<td>Cooperative and collaborative</td>
<td></td>
</tr>
<tr>
<td></td>
<td>group work</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table-3: Learning Matrix
Ubiquity, Web 2.0 and the Digital Tools

Although ubiquity is not a learning requirement, it is a flexibility and desirable tool that supports POPeye orientation. Anytime-anywhere access to information, web-based productivity tools and various computer mediated communication tools are especially well-matched with the POPeye learning orientation. When a project breaks through the space and regular class schedule into the larger world, ubiquity becomes something of real significance.

Digital tools from hand-held devices to web-based applications help students learn wherever, whenever and with whomever they want. Gadgets like the MP3 and MP4 players or even the regular hand phones with cameras can be used to conduct interviews, capture sounds from the nature, take pictures or videos. These field data can be sent directly to any computers via email. Photos and video clips from the hand phones can be sent directly to a blog to report on an event as it unfolds.

Furthermore, new wireless technology such as the Wi-Fi and the WiMax technologies allow students to link to their portable computing devices to Internet at a little expense in some of the Internet cafe around campus or at no expense in the library, student centre, cafeterias and various popular spots in campus not to mention in other public libraries, schools and institutions, shopping malls, private cafes and restaurants in the city and even in students hometowns via free telecenters provided by the government in more than 1800 centers in the country. Most of those telecenters were initiatives from the Ministry of Energy, Water and Communications, Malaysia (KTAK) as a result of provisioning Internet facilities and services in the rural areas under the sixth national policy objective statement of the Communications and Multimedia Act (CMA) 1998. The act aims to provide affordable communication services and ensure equitable provision of affordable services over ubiquitous national infrastructure. Hence, the implementation of rural telecenter initiatives by KTAK addresses the issues of digital disparity between the urban and rural communities and eventually will bridge the digital divide that exist between the urban and rural communities in Malaysia which makes ubiquitous learning even more accessible.

In addition to easier access to Internet, two options that make productivity more portable for anywhere-anytime learning in this course include tiny storage devices such as the thumb drives and portable hard-disk which can be purchased far less than USD200 for a 1Terra Byte (TB) pocket hard disk or less than USD50 for an 8 Giga Byte (GB) thumb drive or a mere USD10 for a 2GB thumb drive. The bottom line is, learners would want to have their own digital face for the world when they are in project mode. From the total number of 213 participants in this study, although most prefer group work, only two learners have a shared blog while others prefer to have their own individual blog for the class project but cooperate via collaborations in various ways by swapping digital media and sharing related links and discussing common problems on the course blog.

The course blog, named computer education as in Figure 2, was created for building communities of bloggers among the computer trainers/trainees in this study as a digital instructional media to smooth out project activities and collaboration efforts. Word Press, which is a free blogging platform, was chosen because it has more design options and administrative control. The blog invites participants to the course blog and link their projects to it. A social-building part of blogging begins when these computer trainers/trainees loosely connect themselves around the topic of accomplishing the five set task for the course as per discussion in screen
capture in Figure 5. They report and reflect on their thoughts and offer dispatches from their own problem and experience trying to reach the project goal through the course blog. Each would publish a “blogroll” (Figure 6), a set of links to other bloggers with whom they feel kinship or with other links that provide resources for their teaching, learning and project accomplishment.

**Methodology**

Three important terms for this study are operationally defined as follows:

- **Hybrid**: a combination of learning and instructional strategy comprising face-to-face, online and self learning.
- **E-Training**: a course, module or program delivered in a hybrid environment as a process of developing knowledge, skills, and abilities in computer trainers for the achievement of organizational goals.
- **ICT/Computer trainers**: Computer or ICT trainers appointed by the university ICT Center, whose role is to support and direct staff in the area of ICT and Computer Science; (ii) educational developers and learning technologists attached to the university’s Computer Center, whose role is to work with or alongside practitioners to enable and enhance e-learning researchers into learning and e-learning, including academic researchers, action researchers and research-project workers; (iii) appointed ICT trainers, teachers and teacher trainees and (iv) ICT educators in the country or Asia in general.

The word ICT and Computer is used interchangeably in this paper, so is the word trainees and trainees.
A number of different communities of users are referred to in this study. Broadly speaking, they are computer or ICT trainers as defined in the terminology at the beginning of this methodology section. Despite their internal complexities, these communities will be referred to in this paper, simply as ICT or computer trainees/trainers. The pilot sample was 42 ICT trainers from the same institution. The subsequent sample originally encompasses 213 participants, 172 females and 37 males, studying at a public university in Malaysia. The trainees were enrolled in credit-bearing education and computer education courses. The age of trainees range from 20 to 48 years old. Highest frequency is in the range of 21-25 years old; that is 62%
(132) of the whole sample. The trainees represented four origin, (31.9% (68) from East Malaysia, 51.6% (110) from West Malaysia, 1.4% (3) from Brunei and 14.6 (31) from mainland China. They make up four main races with 71.4% (152) Malays, 23.9% Chinese, 2.8% (6) Indians and 1.4% (3) from other races. All but 28.2% (60) of the participants had none or less than one year teaching experience.

Instrument

The first version of the adapted instrument yielded 61 items to measure usefulness of a hybrid e-Training course on a Likert-type scale. Likert scale has five points from strongly agree to strongly disagree; those with 6, 7 or 8, etc. are Likert-type scales (Likert 1932). Likert actually scaled the category labels he used. Although the instrument for this study uses a scale of 1-5, no scaling has been done to determine the anchors. In addition, a response category for “Not Applicable” was added for each likert item (Palant 2001). As such we refer them as a "Likert-type" scale. First phase of the study was to establish face and content validity and to test reliability and internal consistency of HiTs. The instrument were reviewed in various aspects; technical, language and instructional design in terms of (i) pedagogical/learning strategy, (ii) theories in practice, (iii) cosmetic design of instructional media and (iv) course functionality. The 61-item instrument still contains 5 constructs at this point namely Content (9-item), Delivery (9-item), Service...
(7-item), Outcome (12-item) and Structure (24-item). Respondents rated aspects of the course on a 1 to 5 scale where 1 equals "strongly disagree" and 5 equals "strongly agree"; 1 represents the lowest and most negative impression on the scale, 3 represents an adequate impression, and 5 represents the highest and most positive impression. They chose N/A if the item is not appropriate or not applicable to the course. Table 4 shows the contents of HiTS after face and content validation.

<table>
<thead>
<tr>
<th>Factors</th>
<th>Item ID</th>
<th>Total Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content</td>
<td>C01 - C09</td>
<td>9</td>
</tr>
<tr>
<td>Delivery</td>
<td>C10 - C18</td>
<td>9</td>
</tr>
<tr>
<td>Service</td>
<td>C19 - C25</td>
<td>7</td>
</tr>
<tr>
<td>Outcome</td>
<td>C26 - C37</td>
<td>12</td>
</tr>
<tr>
<td>Structure</td>
<td>C38 - C61</td>
<td>24</td>
</tr>
</tbody>
</table>

*Total items = 61 (before extraction during principal component analysis)*

**Face and Content Validation**

In order to achieve face and content validity, the researchers thoroughly reviewed related literature and conduct interaction analysis as well as document analysis. Subsequently, discussions with language and technical experts were conducted in addition to judgment process by a jury of five ICT, computer training and education experts. Subsequently, discussions with language and technical experts were conducted in addition to judgment process by a jury of five ICT, computer training and education experts. A pre-test involving 42 students who fits the description of computer trainers at an institution of higher learning in Malaysia was conducted. As a result, we came up with 61-item HiTS. Although the scales were previously established scales, expert judgment was still seek out to ensure adaptations, deletions and additions were justified. When two items have virtually identical content, one was dropped. Items, upon which judges cannot agree, were also dropped. Summated scales were created from the pre-test and items with item-total correlation of less than 0.5 were deleted (Byrne 2006). Factor analysis was not done at this time since the sample size was less than 50.

**Reliability and Internal Consistency**

For the assessment of reliability, this 61-item instrument was administered to 42 computer trainees in a pre-test then to another 213 respondents at a higher learning institution. The cronbach alpha reliability analysis was conducted to ensure the internal consistency was at least maintained if not improved from the pre-test reliability. In the pre-test with 42 respondents, the result indicates overall cronbach’s alpha of 0.957. Reliability test using data from the 213 respondents reveal an overall cronbach’s alpha of .986 as shown in Table 5. After deleting five cases for missing data and outliers, the cronbach’s alpha came out to .987. As seen in Table 5, the alphas of the hybrid e-training measures were high in each of the five constructs. They range from 0.886 to 0.971. Overall analyses suggested that the instrument is reliable to measure usefulness of the hybrid e-training module.
The last step taken after achieving research objective one and two is to achieve research objective number three in preparation for confirmatory factor analysis which is necessary to answer the research question.
This preparation was done using principal component analysis with varimax rotation. Varimax rotation method has proved successful as an analytical approach to obtaining an orthogonal rotation of factors which is the most widely used rotation method for data reduction (Hair et al. 2006; Reinard 2006) meant for subsequent use in other multivariate techniques (Hair et al. 2006). According to Kaiser (1958) as in (Reinard 2006), varimax orthogonal rotation attempts to maximize the variance on factors by minimizing the number of variables loading highly on the separate factors. This process is the default in SPSS. The method normalizes the loadings on pairs of factors prior to rotation and tends to promote finding simple structures in which loadings are high on one factor and near zero on others.

A preliminary examination of the factor matrix in terms of the factor loading was made based on theory and practical significance. Factors in the range of .30 to .40 which are considered the minimal level for interpretation of structure were kept. However, research has shown that factor loadings have substantially larger standard errors than typical correlations (Hair et al. 2006). Thus, to obtain a power level of 80 percent with the use of .05 significance level by a sample size of 208, a factor loading of at least .40 is required for significance (Hair et al. 2006). Table 6 shows the contents of HiTS after principal component analysis.

### Table 6: Contents of HiTS After PCA

<table>
<thead>
<tr>
<th>Factors</th>
<th>Item ID</th>
<th>Total Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content</td>
<td>C03, C04, C05, C06</td>
<td>4</td>
</tr>
<tr>
<td>Delivery</td>
<td>C10, C11, C12, C17, C18</td>
<td>5</td>
</tr>
<tr>
<td>Service</td>
<td>C19, C20, C21, C23</td>
<td>4</td>
</tr>
<tr>
<td>Outcome</td>
<td>C28, C31, C35, C33, C37</td>
<td>5</td>
</tr>
<tr>
<td>Structure</td>
<td>C38, C42, C46, C48, C54, C56, C58, C60, C61</td>
<td>9</td>
</tr>
</tbody>
</table>

### Findings

This section presents the results of the study by answering the research question - Are trainees perspective towards usefulness of the Hybrid e-Training module influenced by the module’s content, delivery, service, structure and outcome? This is done by reporting the results of structural equation modeling process using confirmatory factor analysis to achieve external construct validation.

#### CFA and Construct Validity

This section will illustrate the first four-stage procedure of performing CFA (Hair et al. 2006). The purpose of this procedure is to confirm the hypothesized hybrid module. Having completed Stage 1: Defining Individual Constructs, as explained previously in the methods section with outcome as in Table 3, Stage 2: Developing the Overall Measurement Model was constructed. A visual diagram depicting the first hypothesized measurement model consisting of 27 measured indicator variables and five latent constructs is shown in Figure 6. As prescribed in the CFA stages procedure (Hair et al. 2006), all constructs are allowed to correlate with all other constructs and all measured items are allowed to load on only one construct each but the error terms are not allowed to relate to any other measured variable. Two constructs (Content and Service) are indicated by four measured indicators, another two (Delivery and Outcome) are indicated by five measured indicators and one is indicated by nine indicators. Every individual construct is identified. The overall model has more degrees of freedom than paths to be estimated. Therefore, abiding with the rule of thumb (Hair et al. 2006) recommending a
minimum of three indicators per construct but encouraging at least four, the order condition is satisfied which means the model is over identified. Given the number of indicators and sufficient sample size of 208, no problem with the rank condition are expected either. Stage 3 requires that the study be designed and executed to collect data for testing the measurement model constructed in Stage 2.

Having done that, AMOS 7.0 (Arbuckle 1997) was selected to specify the hypothesized measurement model using the graphical interface to draw the model depicted in Figure 7. The model was estimated using the default maximum likelihood estimation.

![Fig-7: The First Hypothesized Measurement Model](image)

The next stage is Stage 4: Assessing Measurement Model Validity. This is done by comparing the theoretical hypothesized measurement model against reality as represented by the sample. Key fit statistics and the parameter estimates were reviewed. Figure 8 shows the final hypothesized measurement model for the hybrid e-training module. Note that in the final hypothesized model, there are only 18 indicators left. Three constructs (Content, Service and Structure) are indicated by four measured indicators and two other constructs (Delivery and Outcome) are indicated by three measured indicators. Only items measuring one specific construct were kept. Those measuring more than one constructs, were only retained in the construct it measured more appropriately in terms of a higher value of coefficient associated to it in that particular construct.
Data Analysis

To arrive at a conclusion, a confirmatory factor analysis was conducted on the final hypothesized five-factor structure model using AMOS model-fitting program. The program adopted maximum likelihood estimation to generate estimates in the full-fledged measurement model. To assess the fit of the 18-item measurement model, the analysis relied on a number of descriptive fit indices, which included the (i) relative chi-square ($\chi^2/df$), (ii) comparative fit index (CFI), (iii) Tucker-Lewis coefficient (TLI), and (iv) root mean square error approximation (RMSEA). Wheaton et al. in Hair et al. (2006) suggest the use of relative chi-square ($\chi^2/df$) as a fit measure. They suggest a ratio of approximately five or less as beginning to be reasonable. Carmines and McIver in (Byrne 2001) however stated from their experience, $\chi^2/df$ in the range of two to three are indicative of an acceptable fit between the hypothetical model and the sample data. The possible values of CFI and TLI range from zero to one, with values close to one demonstrate a good fit and a value of .08 or less for RMSEA shows a reasonable error of estimation (James et al. 2006).

![Diagram of the hypothesized e-Training model]

Fig-8: The hypothesized e-Training model: C3-C58 represents observed variables; e4-e19 represents error variances; single headed arrows from factors depict factor loadings

Hypothesized Model

Figure- 9 presents the estimated five-factor model for the hybrid module using the data.
drawn out from the test sample (N=208). Items from each scale are assumed to load only on their respective latent variables and some of the overall fit indicators and parameter values are shown in the figure. The results indicated that the parameters were free from offending estimates, ranging from .85 to 1.11. Both fit indicators (CFI & TLI) exceeded threshold of .90, the standard deemed important for model fit. However, the root-mean square error of approximation (RMSEA=.88) reflect a possible fit problem.

**Revised Model**

A closer examination of the results revealed one possible reason for the model’s lack of fit. Evidently, the standardized residuals associated with observed indicators C6 (e1=.32) and C18 (e5=.76) had created some problem. Typically standardized residuals less than |2.5| do not suggest a problem; conversely residuals greater than |4| raise a red flag and suggest a potentially unacceptable degree of error. To deal with the “noises”, the hypothesized model was revised, with the two problematic indicators being excluded in the subsequent analysis (Hair et al., 2006).

To validate the likelihood of the revised five-factor model, another confirmatory factor analysis was applied on the same sample. The overall fit of the 16-item measurement model is summarized in Fig.8, the final revised model. The magnitude of the factor loadings were substantially significant with CFI=.943 & TLI=.930. The model is free from offending estimates, and the internal consistency estimates satisfied the standard deemed necessary in scale construction. The cronbach alphas for the five sub-constructs after CFA are range from .814 to .909 (content=.831, delivery=.865, service= .885, outcome=.814 and structure=.909) while cronbach alpha for the whole section measures = .959.

**Discussion**

In summary, a psychometrically sound instrument is evidence by a high reliability and validity. Therefore, a rigorous effort has been invested in developing the Hybrid E-Training Instrument. According to Hair et al. (2006), the generally agreed upon lower limit for Cronbach’s alpha is .70. In this study at three phases the overall Cronbach’s Alpha for the instrument succeeded the standard. The results indicated that the instrument is a highly reliable instrument. In addition, the principle component analysis results indicated that there were five dimensions emerged for the Hybrid scales, namely content, delivery, service, outcome and structure. In order to confirm which items belong to what constructs, i.e., to test the construct validity of the Hybrid Module, confirmatory factor analysis was conducted. Findings showed evidences for construct validity. Goodness-of-fit measures of comparative fit index (CFI) and non-normed fix index (NNFI also known TLI) were above suggested threshold > .90. In reference to model fit, researchers use numerous goodness-of-fit indicators to assess a model but in general, for one time analysis TLI, CFI and RMSEA are preferred (James et al., 2006). According to Browne and Cudeck in James et al. (2006), a value of 0.08 or less for the RMSEA would indicate a reasonable error approximation and would not want to employ a model with a RMSEA greater than 0.1. As such we consider the RMSEA for the final revised model of 0.86 as acceptable although generally the general accepted threshold would be RMSEA < .08.
Fig-9: The Final Revised Model for the Hybrid Module
Conclusion
This paper presented a rationale for adaptation of an established learning model to suit the Asian population specifically Malaysian culture. Through an extensive analysis of documents and interaction analysis conducted earlier in the feasibility study, the Demand Driven Learning Model (DDLM) was selected for adaptation based on the similarities between the emerged themes and the components of DDLM. It can be use (i) for program evaluation, (ii) to lead development of new training module, (ii) to guide decision making or (iii) adaptation for further improvement. Further analysis shall help determine or rank the usefulness of each constructs that made up the model thus further help to contribute decision making.
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Marquadt, M.J. 1996. Building the learning organization


Ne(x)t Generation Skills for Teachers’ Professional Development: Applying a Learning Theory in 3D Learning Environment

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Sofia Mysirlaki
Ioanna Talanti
Hara Mpouta
University of Piraeus, Greece

Abstract

‘Edutainment’ as an emerging trend in education is a pragmatic issue in training programs. Continued PD programs for teachers in 3d environments are the key to successful and meaningful interaction and collaboration in educational settings. Teachers are involved in new learning processes, exploiting their role as ‘designers’ and contributing to meeting new learning requirements.

A well-designed teacher training program in Second Life (SL) attempts to meet the needs of modern teachers, who need to learn as ‘designers’ ‘what’, ‘how’ ‘when’ and ‘why’ to use the 3d learning environments effectively for their teaching, delivering and reflecting in action the new learning experiences of professional knowledge, skills and values.

Extending previous research and acknowledging the lack of theoretical foundations based on interdisciplinary perspectives of computer science, instructional design and learning psychology for teachers’ PD, we propose pedagogical scenarios based on Cognitive Apprenticeship Learning Theory and Second Life, in order to enhance situated experience in teachers’ professional and career development.

Introduction

Our previous research indicated that training programs for Teachers’ Professional Development are critical for guiding educators through the complexity of the learning process (Paraskeva et al., 2008). The same study indicated the potential role of 3d gaming learning environments as ‘edutainment trends’ for Teachers’ training. These training programs can provide opportunities for teachers to learn and teach with innovative technologies. We argued that the combination of social constructivism approaches with the edutainment learning environments could be an appropriate vehicle for teachers’ training, which could enhance teachers’ collaboration, problem solving and cognitive and meta-cognitive reflections in their educational practice.

In this paper we propose an educational scenario based on the Cognitive Apprenticeship Model as an implicit method of learning processes to shape 3d activities of SL, with the confidence that it can have a positive impact on teachers’ professional development for further reflections on their school work.

We present the components of an educational scenario in order to describe a well designed project in 3d technologies used in teachers’ training intending to teach them in a fun and
engaging way via collaborative activities. In order to develop a set of effective activities, we implemented the methods of cognitive apprenticeship model, engaging the teachers in learning activities and social practices through modeling, coaching, exploration and other best practices in order to solve complex authentic real-world problems and provide meta-cognitive solutions according to the needs of the educational practice.

Theoretical Background

**Ne(x)t Generation Skills**

It is common ground that 21st century people require a different set of skills in order to cope with the complexity and the faster pace of life, than people in the old days did. These are known as “the skills for 21st century”, or next generation skills, and they are all fundamental to the success of knowledge workers (Galarneau & Zibit, 2006).

The skills people need to develop have to do with problem solving and identification, developing critical facilities, understanding the value of experimentation, and the ability to collaborate (Reich, 1992). Next generation people need to develop “digital age literacy, inventive thinking, effective communication, and high productivity” (Burkhardt et.al., 2003).

Competencies and skills needed for today are about learning; those that help us “learn something, do something or reach an aim,” and they “involve creativity, ability for innovation, mobility, flexibility, endurance, reliability and precision. (Canto-Sperber and Dupuy 2001) These competencies show an ability to learn from unforeseen situations and circumstances and to cope with life situations.” (Canto-Sperber and Dupuy 2001)

The most valuable skills someone can acquire are the skills to learn rapidly and efficiently and to go into almost any situation and figure out what has to be learned (Morrison, 2001). according to that, Dede (2000), has identified three specific abilities that are of growing importance:

- Collaborate with diverse teams of people—face-to-face or at a distance—to accomplish a task.
- Create, share, and master knowledge by assessing and filtering quasi-accurate Information.
- Thrive on chaos, that is, be able to make rapid decisions based on incomplete information in order to resolve novel dilemmas

Nowadays learning is not longer considered as an individual process, but as a social one, that is, now more than ever, influenced and accomplished through a network of peers, colleagues, friends, and family. (Riel and Polin, 2004; Seely-Brown, 2002). As our need for collaboration grows, so too have the tools that connect us in social networks and support the creation of online communities (Haste 2001; Schrage 1990).

It is claimed that online communications facilitate groups of people coming together over the network to discuss any issue imaginable, to ask questions and share provocative insights to which others can respond (Educom Staff, 1997; Lessig, 2001). These online social environments can evolve into “online learning communities” when they foster participants to actively engage in sharing ideas with others, fostering knowledge sharing.

In these learning communities knowledge is generated through social intercourse, and through this interaction we gradually accumulate advances in our levels of knowing, theories derived from Dewey and Vygotsky (Anderson and Kanuka, 1998). The modern world requires that knowledge not be limited to one individual’s thinking, but rather shared and accessed in a variety of ways.
Thriving on chaos, means having the “ability to learn from unforeseen situations and circumstances.” (Canto-Sperber and Dupuy, 2001). It is equal to making a rapid decision based on little information.

‘Ne(x)t-generation’, is a term that is used to describe the people that grew up with ICT, having a whole different set of needs and skills than older people had. This term stems from the term “Net Generation”, that was first mentioned by Don Tapscott (Tapscott, 1998), used to describe the generation that grew up immersed in a digital--and Internet--driven world. Since then, different terms have been used to describe this group, such as ‘digital natives’ (Prensky, 2001), ‘millennials’ (Howe and Strauss, 2000) or Google generation (JISC, 2008).

In the literature, authors assign the following characteristics to the ne(x)t generation:

- Fast and impatient
- Learning by doing
- Result-oriented
- Social and interactive
- Multi-tasking
- Visually oriented
- Connected and mobile

This new generation of people, such as Second Life users, through access to the Internet have amassed thousands of hours of rapidly analyzing new situations, interacting with characters they don’t really know, and solving problems quickly and independently” (Beck and Wade, 2004).

The ne(x)t generation has a whole different set of needs, regarding the basic elements of a learning experience, such as cognition, learning, collaboration, Skills – Competencies and the Educational Context (Table 1) (Dede, 2005).
Table 1 The ne(x)t generation needs

<table>
<thead>
<tr>
<th></th>
<th>Past Generation</th>
<th>New Generation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cognition</strong></td>
<td>Finding information</td>
<td>Seeking, sifting, synthesizing disparate sources of data</td>
</tr>
<tr>
<td></td>
<td>Sequential assimilation of linear information stream</td>
<td>Multitasking among disparate experiences and information sources</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Focus on associative interconnections among chunks of information</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Constant reflection on and sharing of experience</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mind extended via distributed cognition, sensation, memory</td>
</tr>
<tr>
<td><strong>Learning</strong></td>
<td>Memorization</td>
<td>Understanding</td>
</tr>
<tr>
<td></td>
<td>Recalling information</td>
<td>Discovering</td>
</tr>
<tr>
<td></td>
<td>Knowledge</td>
<td>Applying knowledge in practice</td>
</tr>
<tr>
<td><strong>Collaboration</strong></td>
<td>Collaboration dependent on shared physical presence or cumbersome virtual mechanisms</td>
<td>Loosely bounded communities</td>
</tr>
<tr>
<td><strong>Skills - Competencies</strong></td>
<td>Discrete skills such as literacy and numeracy</td>
<td>Collaborate with diverse teams of people—face-to-face or at a distance—to accomplish a task</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Create, share, and master knowledge by assessing and filtering quasi-accurate information</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Thrive on chaos</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The ability to learn rapidly and efficiently</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Inventive thinking, effective communication, and high productivity</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Creative—collaborative patterns</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Critical thinking</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Problem solving</td>
</tr>
<tr>
<td><strong>Educational Context</strong></td>
<td>Locations and physical infrastructures configured to accomplish specialized forms of activity (such as computer lab)</td>
<td>Place-independent Communities of learners</td>
</tr>
</tbody>
</table>

Source: (Dede, 2005)

Therefore, the sheer magnitude of human knowledge, world globalization, and the accelerating rate of change due to technology necessitates a shift in our children’s education—from plateaus of knowing to continuous cycles of learning (Burkhardt, 2003).

Educational environments need to aim at developing these needs in order to educate 21st century skilled people. Though, it is striking that many people today are not acquiring these 21st century skills through structured learning environments that anticipate these needs, but rather through various “cognitively-demanding leisure” activities they choose to engage with, including to a larger and larger extent, videogames (Johnson, 2005), and virtual worlds. Virtual worlds, such as Second Life, are not simply games in the traditional rules-based sense, but rather “persistent social and material worlds, loosely structured by open-ended (fantasy) narratives, where players are
largely free to do as they please” (Steinkuehler, 2004).

Stemming from the need for developing next generation skills, education needs to be reformed since as Marshal McLuhan once said “Our age of anxiety is largely the result of trying to do today’s job with yesterday’s tools”. According to that, innovative tools, such as 3d environments and games, are just what we need to teach the new generation 21 century skills.

Still, the main question is: Can teachers teach 21 century skills? We believe that teachers could develop and learn to teach ne(x)it generation skills, by collaborating in a 3d environment, such as Second Life, which could be used as an innovative tool for teachers’ training. This combination of learning and fun affects personal and social factors contributing to teachers’ effective Professional Development.

**Teachers’ Professional Development (TPD)**

Nowadays, there is a significant increase in the level of interest and support that teachers throughout the world are receiving in their professional development. Professional development, as a general concept, refers to the development of a person in his or her professional role. Teacher Development refers to the professional growth a teacher achieves as a result of gaining increased experience and examining his or her teaching systematically (Glatthorn, 1995). Professional Development is frequently viewed as being an additional practice that teachers are required to perform, and aims at developing, implementing and sharing teaching practices, experiences, knowledge and values, which help them to be effective in their profession. Thus, professional development constitutes a collaborative effort, in which teachers interact with peer networks and experts. According to Villegas-Reimers (UNESCO, 2003), promoting teachers’ professional development involves enhancing teaching effectiveness and supporting professional growth.

Professional development could be either formal (such as attending workshops and professional meetings, mentoring, etc.) or informal (such as reading professional publications, etc.) (Ganser, 2000). Today, the widespread need for incorporating technology in school settings plays a significant role in professional development and teachers are pressed to integrate technology into teaching and learning.

The educational technology professional development literature focuses primarily on technology integration into the curriculum (King, 2002). It is essential that professional development have to direct teachers’ needs to learn and use technology in their practices.

Traditionally, teacher Professional Development required that teachers attend one-off conferences, which included experts who informed them about university research findings regarding emerging trends for improving educational outcomes (Hargreaves, 1997; Kenway et al, 1999). Studies of professional development programs, developed and implemented by outside providers and informal teacher networks, have consistently found that professional development programs are disconnected from practice, fragmented, and without cohesion (McLaughlin & Mitra, 2001; Smylie et al., 2001; Corcoran et al., 1998; Garet et al., 2001). Also, these approaches were essentially un-connected to broad school directions and, after the conference, there was little opportunity for support and follow up at the local level (Spillane, 2002).

According to Bredeson and Scribner (2000), teachers have traditionally left such conferences with a sense of enthusiasm, but with little real understanding or time to consider the applicability of the new ideas to their own practices. These training approaches were based on the behaviourist
model, which simply focuses on input and transmission of teachers’ knowledge. Moreover, many programs lack key pedagogical, content, and structural characteristics of effective professional development that are needed by the teachers. Thus, these approaches do not support continuity across stages of the professional development and cannot accommodate teachers’ needs successfully.

We recognize the fact that teacher professional development is more than a series of training workshops, institutes, meetings, and in-service days. With technology rapidly changing, teachers need to focus on the following (Bybee & Loucks-Horsley, 2000):

- Learning about and developing skills related to technology, and deepening their content knowledge
- Creating opportunities to learn how to teach technology
- Acquiring tools that will allow them to continue their own learning
- Being provided with long-term process-oriented opportunities, so that teachers are at ease using technology and are able to use it effectively.

Therefore, it is essential to move from traditional teacher professional development to more innovative and effective ways for teachers training and professional development.

A Pedagogical Scenario for Ne(x)t Generation Teachers: Cognitive Apprenticeship Model Applied in Second Life

The lack of theoretical foundation from an interdisciplinary perspective of computer science, instructional design and a strong learning theory may put the teachers in the position of ad hoc experts. We believe that teachers could develop and learn to teach ne(x)t generation skills, by collaborating in a 3d environment, such as Second Life, which could be used as an innovative tool for teachers’ training. This combination of learning and fun affects personal and social factors contributing to teachers’ effective Professional Development.

It is important for educators to develop scenarios for both professional and practitioner needs. Though, educators have to accomplish issues of ‘what’ ‘how’ ‘when’ and ‘why’ to use these scenarios, in order to develop best practices for students’ learning. This needs to customize issues for teacher’s training for further implementation in educational practice (Huang, S-T, et al. 2005).

Thus, we propose an educational scenario that can be utilized in a Teachers’ Professional Development program in Second Life environment with a view to continuously improving effectiveness and quality. We aim to meet the needs of today’s teachers, who want to learn as “designers” “what”, “how”, “when” and “why” to effectively integrate the 3D learning environments in their teaching practices.

Methodology

The proposed scenario exploits the 3d environment of Second Life and aims to develop the 21st century skills. In this work we followed the ADDIE model in order to apply Cognitive Apprenticeship theory and offer a pedagogical scenario that teaches the ARCS Model of Motivational Design.

This scenario is described according to the Kobbe/Kaleidoscope framework, which identifies a script’s components as the individuals that participate in a script, the activities that they engage in, the roles they assume, the resources that they make use of and the groups they form (Kobbe, 2005).
The Educational Scenario Components

The components of the educational scenario, according to the Kobbe/Kaleidoscope framework, are described below:

Resources: We utilize a 3d environment in SL in such a way as to foster collaboration and discussion among teachers, allowing interactions that can be captured and analyzed by using log files. The SL offers a variety of communication possibilities via chat, email, forum and nonverbal avatars’ communication. This environment also supports presentations resources, such as Videos and Simulations (the content of which follows the ARCS Model of Motivation Design), e-books, articles and assessment resources, such as portfolios in order for teachers to keep a record of their work. This 3d environment has the ability to embody a variety of resources depending on the teachers’ needs (new activities, exercises or tests).

Participants: The participants are teachers of primary and secondary education, as well as university professors who are experts in specific domains of Educational Psychology (i.e. motivation).

Groups: The groups consist of three to five members depending on the number of participants as well as the scenario’s requirements.

Roles: Each teacher is a member of a team. In each team, a teacher has the role of Moderator, a leading role he/she undertakes to represent his/her team and also guide and coordinate team members aiming at accomplishing the undertaken activities. A second role of an expert, (i.e. university professors Experts) has the responsibility to coach, or gradually reduce coaching (fading), providing guidance, advice, suggestions on the basis of the strategies mentioned below (Larkin, M., 2002, Yelland, N. & Masters, J., 2007). To sum up, in our script there appear the roles of Group Participants, Individual Learners, Moderator and Experts.

Activities: The Learning Activities are based on the ARCS Model (Keller, J. M., & Suzuki, K., 2004, Keller, J. M., Deimann, M., Liu, Z., 2005) and are implemented within the 3d environment of Second Life. Experts help teachers to learn and apply the four steps for promoting and sustaining motivation, according to Keller’s ARCS Model of Motivational Design (Attention, Relevance, Confidence, Satisfaction). Teachers should be able to produce activities in SL for promoting and sustaining motivation according to Keller’s ARCS.

Group formation and component distribution: The group’s size should be between 3 and 5 teachers and should include both males and females, either from the same educational field or from different ones (i.e. Mathematics, Language etc.).

Sequencing: Based on Cognitive Apprenticeship theory (Ghefaili, A., 2003, Chen, Q. and Yao, J. 2005), the sequence of activities scripted in each phase of the scenario is:

Phase 1: Modeling

The teachers in groups attend tutorials with the following the four steps of:

Attention: examples offering:
- Perceptual arousal (using novel, surprising incongruous and uncertain events) or
- Inquiry arousal (by posing interesting pictures, videos about a theme or challenging questions and problems to be solved)

Relevance: use concrete language and examples that teachers are familiar with
Confidence: use concrete examples of successful people (how they feel, what they think about “meet your objectives”, etc.)

Satisfaction: use concrete examples of people that feel satisfaction about their actions

The teachers discuss via thinking out – loud techniques such as:
- Prompting
- Echoing
- "Conversational disequilibrium"
- Summarizing at key junctions

In SL: Teachers’ groups and experts (represented by avatars), meet in the 3d world to watch video-tutorials demonstrating the four steps of Keller’s ARCS Model of Motivational Design (Attention, Relevance, Confidence, Satisfaction). The groups then discuss using the communication features that SL provides.

Phase 2: Coaching

Experts help teachers to learn and apply the four steps of Keller’s ARCS Model of Motivational Design (Attention, Relevance, Confidence, Satisfaction).

In this context, teachers engage in activities used:

For Confidence:
- presenting objectives, prerequisites and evaluation criteria
- small steps of growth
- feedback and support internal attributes for success
- control strategies over their learning

For Satisfaction:
- rewarding
- opportunities to use new knowledge in a real learning setting
- feedback and reinforcement

In SL: The teachers form groups and engage themselves in a series of activities found in various rooms, so that they will be taught various ways of promoting motivation. The activities appear in various forms, since the requirements may differ (i.e. watch a video, see pictures, listen to music, etc).

Phase 3: Scaffolding

The same world provides additional material (videos, related articles, etc) to help teachers.

Experts gradually reduce coaching (fading) as teachers learn more complex tasks (they intervene providing guidance, advice, suggestions) on the basis of the strategies mentioned below (Larkin, M., 2002, Yelland, N. & Masters, J., 2007):

Regulate difficulty during guided practice
- Start with simplified material and gradually increase the complexity of the task.
- Complete part of the task for the student.
- Present the material in small steps.

Provide varying contexts for student practice.
- Engage in reciprocal teaching.
- Have teachers work in small groups.

Provide feedback.
- Provide models of expert work.
Increase student responsibility.
- Practice consolidation - putting all the steps together.
- Check for student mastery.

Provide independent practice.
- Provide extensive practice.
- Facilitate application to new situations.

**In SL:** Experts help when needed by
- suggesting additional material
- posing questions for consideration
- setting the stage for discussions making use of the communication features that SL provides
- providing additional material so that teachers will learn and become familiar with various ways of promoting motivation
- helping in the course of activities

**Phase 4: Articulation**
Experts encourage teachers to interact with one another and use the resources found in the world (videos, articles, e-books, etc).

Teachers engage in a dialogue
- verbalizing their thoughts
- reasoning critically in collaborative activities
- Teachers articulate their opinion in written assignments.

**In SL:** Teachers engage in a dialogue making use of the communication features that SL provides (via chat, email, forum, nonverbal avatars’ communication).

In SL each team has its own space which acts as a pool for their assignments (rooms 2,3,4,5).

**Phase 5: Reflection**
Teachers collaborate in order to:
- analyze their thoughts
- compare their opinions with others
- evaluate their performance

Experts encourage teachers to collaborate and discuss their actions.

**In SL:** Teachers engage in a dialogue making use of the communication features that SL provides (via chat, email, forum, nonverbal avatars’ communication).

**Phase 6: Exploration**
Teachers are encouraged:
- to inspire new activities that represent real–life situations and could mediate to develop motivation,
- to express new goals and innovative ways of developing motivation.

**In SL:** Teachers and experts meet in order to pursue inspiration and solutions to new activities related to motivation development making use of the communication features that SL provides (via chat, email, forum, nonverbal avatars’ communication) and submit their products in a special space provided to them.
Conclusion

This paper proposes that the 3d learning environment is a pragmatic issue in training programs for Teachers’ Professional Development (PD). These training programs could be effective and innovative based on cognitive apprenticeship model for teacher professional development.

We argue that the 3d learning environments could be used to train teachers to develop 21st skills (collaboration, engagement, etc) in order to transfer them to the ne(x)t generation. In addition, this training environment could be used not only to train teachers to integrate technology in their classrooms, but also to teach them in a fun and engaging way via collaborative activities.

We believe that by training teachers with such a tool, they would develop 21st century skills as a set of effective social practices, in order to solve complex authentic real-world problems and develop critical thinking and meta-cognition.

By this paper we try to answer the question “how today’s teachers learn to use innovative tools, such as 3d learning environments, effectively in their teaching”?

To this direction we propose a pedagogical scenario based on Cognitive Apprenticeship Theory and Second Life, enhancing collaborative and situated experience on the teachers’ continuing professional and career development programs.

This paper could offer additional support to more recent researches that have begun to explore the importance of 3d and gaming learning environments in training programs for teachers in order to develop continuing professional programs, which in teacher could manage their role as ‘designers’ in ne(x) generation skills in schools. Furthermore, in order to create effective professional programs for teachers, we need to exploit the modern technologies such as 3d learning environments/gaming (SL), the theoretical background of instructional design via educational scenarios and the theoretical background of learning such as situated, authentic and collaborative activities, as tools in every day educational practice.

Moreover, these settings could play an important role in the teachers’ performance in their work environments influencing the way in which teachers interact with this technological environment with the students. In addition to these aforementioned approaches, the teachers could adopt these technologies, scenarios and learning approaches that considerably influence their effective use and integration of the latter at school learning solutions.

In order to demonstrate these solutions in the training programs for the school teachers we propose this work for further research approaches, by effective continuing Teachers’ Professional Development (TPD) programs that need to exploit the new role of the teacher in every day educational practice in the direction of:

- the next generation skills, as ‘authentic life’ skills
- the instructional design, as educational scenarios
- the learning background, as cognitive apprenticeship model that describe the implicit processes of learning
- the new trends of the technology, as Second Life and other 3d environments.

Developing the aforementioned parameters we propose the TPD programs in the basis of ‘next generation designers’ of ‘what’ ‘how’ ‘when’ and ‘why’ could teachers develop effective educational scenarios based on 3d learning environments (SL), exploiting the declarative, procedural and conditioning aspects of learning.

For future studies we stress the need for explaining how customization issues based on interdisciplinary approaches of computer
science, educational psychology and instructional design are essential and effective in educational practice connecting the educators’ work with the designers’ issues. Ad hoc we propose this framework for further implementation and evaluation.
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Faculty Development in Instructional Technology: Challenges and Best Practices

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Abstract

One of the many challenges of higher education institutions is to implement technology solutions to improve instruction. The challenge is mainly due to faculty’s hesitation to adopt and internalize these initiatives. This paper will propose some best practices in faculty development in instructional technology within the proper context of higher education.

Among the best practices are: to develop an academic technology plan, extensive investment in technology infrastructure, support from senior leadership, support for faculty members, and support for students.

All academic technology enhancement initiatives should incorporate some basic components such as faculty training and continued support, developing student technology literacy, and an assessment plan to research, evaluate, and disseminate the results of the initiative. The technology evangelist on campus, or faculty developer, who wishes to initiate and lead this effort, should do a good job of tying the effort back into the issues the institution cares about the most: accreditation and quality enhancement efforts, feedback from faculty and staff, or the infrastructure investments the institution already made. These will improve the odds of the initiatives coming to fruition.

Introduction

Teaching and research are the central missions of higher education, in addition to service. With increasing demand in higher education (lifelong learning, non-traditional students, global education) and in an effort to decrease costs, using technology to improve the teaching-learning process became a major effort in academia. Technology brings the promise of creating distributed learning environments that extend learning outside the walls of campus buildings and designated class hours. With the advent of Internet and more recently Web 2.0 technologies, academia actually found itself in a position to play catch with the way the new generation of learners uses technology, interacts with the world, and accesses information.

Scarcity of financial resources is not the only challenge campus leaders are facing in the race to catch up with technology and use it meaningfully in the service of teaching and learning. No matter how much technology is adopted at the campus leadership or at the learner level, the penetration of technology in the individual curriculum and course activities level has one weak link: faculty. As long as the institutions do not systematically address traditional faculty members’ hesitation to adopt and internalize these technology initiatives, the penetration of technology initiatives are destined to get stagnant at the level of early adopters.

This paper will propose some best practices in faculty development in instructional technology and discuss some ideas.

Background
Introducing and sustaining technology initiatives to enhance the teaching-learning process necessitates a deep understanding and intuition about the nature and issues of higher education institutions and faculty members. The campus technology leader or technology evangelist will need to juxtapose these characteristics against the best practices of university education to devise the right strategy to leverage the technology initiatives.

**Characteristics of Higher Education Institutions**

Characteristics and assumptions with which traditional institutions of higher education function should also be taken into consideration when delineating the challenges of technology use. American universities measure different inputs (the institution’s philosophy and mission, funding, curricula, faculty experience, student quality, facilities, governance structure) as indications of instructional success and organizational effectiveness, as opposed to European universities where main indicator of instructional success is student learning as measured by final examinations (Hanna, 2000b). For example, traditionally embraced philosophy is students coming to campus for learning. Instruction is face-to-face lecture, teacher-centered and measured by seat-time. Faculty experience and quality is indicated by number of full-time faculty members, their credentials, research productivity, and external grants (note the absence of direct measure of teaching and learning effectiveness). Learning technologies, if any, are usually used to enhance on-campus lecture format, resulting in lecture halls and classrooms with high-technology equipment (Hanna, 2000a).

In the case of traditional universities then, introducing sustainable technology initiatives that will permeate into the classrooms as well outside the traditional boundaries of learning, necessitate transformational leadership, in addition to the technological staff.

**Characteristics of Faculty Members**

Faculty members are faced with multiple challenges when it comes to using technology in their teaching. Tenure-track faculty struggle with the pressure of research and publishing, in addition to extra teaching loads and service work that the departments usually assign to new members of the department rather than the seasoned tenured faculty members. Tenured faculty, on the other hand, having gained the much-deserved job security and freedom, usually focus on publishing through mentoring graduate students and getting further recognition in their research field and professional organizations, without really pushing themselves to do much of innovation in terms of their teaching practices, barring exceptions. One other type of faculty are the kind who is closer to retirement, whose research is becoming extinct and there is not really much for them to aim at, other than recognition for teaching. These are the kinds of faculty members who desire to get more in the realm of using technology for innovation in their classroom. The challenge there seems to be though, that most of these faculty members lack the foundational technological skills upon which instructional technology skills can be built.

These differences aside though, all faculty members have a common worry when it comes to using technology in their teaching: when they walk into their classroom, they want things to work. They fear of losing control of the students, of the classroom, of the learning process by having to try to figure out what is wrong with the projector, or the computer, or the student’s clicker. There is rarely immediate help that can fix these problems for faculty, as many of the technical support units are minimally staffed. Understandably, faculty want to avoid situations that would lead to loss of valuable
class time or those that would lead to frustrations on the part of themselves as well as students. The result is then to resort to what worked for hundreds of years: plain lecturing using a black (or white) board, with students on the receiving end, passively taking notes.

**Principles of Good Practice in Today’s Higher Education**

In their 1991 book, Chickering and Gamson outlined seven principles that should provide the framework for organizing learning environments in the new era (Chickering and Gamson, 1991). These principles were very influential in the emergence of many theoretical frameworks and practices (collaborative learning, communities of practice, problem-based learning, interactive learning, etc.) to describe the universities that possess these characteristic of best practice. These seven principles are:

1. Encourage contact between students and faculty,
2. Develop reciprocity and cooperation among students,
3. Encourage active learning,
4. Give prompt feedback,
5. Emphasize time on task,
6. Communicate high expectations
7. Respect diverse talents and ways of learning.

It would not be an overstatement to say that the principles of good practice in higher education (Chickering and Gamson, 1991) require the institutions to transform the way they disseminate information from a teacher-centered, discipline-based approach to a student-centered, collaborative, and many times interdisciplinary one (Hanna, 2000a). With the advent of technology, many of these principles can be addressed by incorporating instructional technology solutions in the teaching-learning process. For example, course management systems (Blackboard ©, Angel ©, DesireToLearn ©, etc.) incorporate communication tools that help faculty achieve extended contact with and among students. These platforms also provide for collaborative activities or working on projects that encourage active learning. These technology tools have the affordances for creating diverse paths to learning (self-paced learning) and monitoring the actual time spent on learning activities as well. Utilizing these technologies also distribute the learning, hence serve the needs of a growing non-traditional, part-time learners who demand more from the higher education institutions. The range of instructional technology is much wider than what course management systems offer, hence, the promise of technology in achieving the principles of good practice is very real and cannot be dismissed.

**Faculty Development in Instructional Technology**

It should be obvious to the reader by now that the key to achieving technology initiatives for the teaching-learning process is to get the university administration on your side. Administrative engagement in the process is essential to all institution-level and systemic initiatives. Hartman (2008) lists the elements of success, sustainability, and quality of teaching and learning with technology as follows:

- Alignments with institutional mission and goals
- Administrative awareness and engagement
- Fiscal resources
- Infrastructure
- Facilitation
- Faculty development
- Standards
- Policy formation
- Comprehensive assessment and data collection
These elements can be further grouped under administrative and policy concerns; infrastructure; faculty development and support; technology literacy and support for students; research, evaluation, and dissemination of efforts.

**Administrative and Policy Concerns**

It is of utmost importance to align the technology initiatives with institution’s mission and goals, and this extends to aligning the initiatives with accreditation goals and procedures. Accreditation is so important to institutions that if the instructional technology initiatives can show to have an impact on outcomes, their inclusion in the institution’s or department’s accreditation plans if very highly likely. Certainly, the fiscal resources of the institution is a major constraint; however, if campus academic technology leaders can exhibit the benefits of the initiative to the administration, with a well thought-out plan that minimizes the cost and maximizes the scalability and utility of the initiative, most campus administrators will see the benefit. Say for example, you are proposing to adopt a campus course management system. One way to get administrators on board is to mention the possibility of introducing reduced seat-time as a result of having more course components online. Reduced seat-time for campus courses means more facilities will be available for additional course offerings that can potentially bring more students to campus, which may mean increased revenues for the institutions. Of course, this scenario does not factor in the revenues that can be gained through distance education when a campus course management system is adopted.

One important aspect of the instructional technology adoption efforts is the creation of policies at the institution level to encourage the development and usage of these resources. Tenure process needs to be revised to give importance to teaching with technology and innovative uses of technology. Academic units should consider giving release time to faculty and provide them with resources. There may be units that already do these on a case-by-case basis; however, policies should be created for these efforts to be systematic. Measures of faculty productivity should also include the activities to create courses with heavy use of technology; for example, creating a Web-based course should count more towards productivity compared to teaching a freshmen course for 500-students (Olcott and Schmidt, 2000).

**Infrastructure**

Institutions that has the best record in achieving technology adoption in teaching have extensive investment in technology infrastructure (Bates, 2001). This investment in many cases extend beyond the campus walls, in the form of providing home computing hardware for faculty as well as remote access to campus resources for faculty and staff. Some institutions invested in mobile learning devices (laptops, Tablet PCs, iPods, etc.) for their students whereas others improved the campus computer labs and residence halls for computer and Internet access. Institutions that are well-networked with their peers that are constantly in search of the most effective and reliable technologies that have the highest return on investment seem to invest in infrastructure that add value to the teaching-learning process.

**Faculty Development and Support**

Institutions should make technology literacy an absolute prerequisite for faculty, in addition to providing continuous training for upgrading their skills (Olcott and Schmidt, 2000). This continuous training should focus not only on technology per se, but also on the instructional principles surrounding the use of technology; the why and when, in addition to the how. The ability to use a given technology
to its highest potential depends on the full understanding of basic principles of designing, implementing, and evaluating instruction (Olcott and Schmidt). Institutions should consider reviewing the number of instructional designers that they employ and these designers are utilized to maximize their impact on the meaningful use of technology in service of teaching.

Consequently, faculty development needs to be a constant effort to be included in the technology initiatives. For the best results, this should be a shared undertaking between the faculty development office and the instructional technology office, with expertise from both sides. At some institutions, these two functions are united under an office for educational enhancement; however, at many institutions, instructional technology is still under the purview of the campus information technology officer and almost exclusively detached from the faculty development unit. Advantages of partnership between these two offices are several; one of which being faculty perception. Faculty development offices are usually at a better proximity to faculty than the technology offices. Faculty approach a fellow Ph.D. holder from the faculty development office with more enthusiasm and acceptance than they would a consultant from the technology office.

Another important aspect of faculty support is providing them with help to create instructional materials using technology. One of the biggest impediments to using technology beyond projectors or PowerPoint slides is that most faculty do not have the time to devote to materials creation. Support in terms of graduate students or student workers, or staff members provided through a grant in most cases is essential. However, many institutions fall into the trap of failing to continue to train faculty members, thinking that the support through extra staffing will sustain the effort. Students come and go, grant money gets depleted, and what remains constant in the teaching process is the faculty themselves. Therefore, it is very important for technology initiatives to continue emphasizing faculty development, even at the presence of generous opportunities for support for instructional materials creation using technology.

**Technology Literacy and Support for Students**

A campus instructional technology initiative should also consider including a student technology literacy program or periodic and systematic technology training for students. Such a program would require high collaboration with the academic units in terms of providing the proper hooks into the official curriculum. Faculty members would incorporate additional training on these technologies into their syllabi, in a similar fashion to how they integrate writing center or library services trainings. For example, if a course uses a certain kind of instructional software or system (e.g. Blackboard ©), technology services unit on campus could offer a short overview for the students during the lecture hour, with additional training available for those who want further help. The technology unit can also provide the faculty with materials on these technology tools and services, in the form of creating accurate instructions, both on paper and online.

These technology literacy skills for students can be jointly outlines by the academic services, academic departments, and the technology unit on campus. The topics can go beyond what is utilized in the classroom to topics such as information security, protection of personal information and privacy, plagiarism in the digital domain, copyright, etc. Some of these skills can be incorporated into the introductory level freshmen courses, if the institutions offers any.

**Research, Evaluation, and Dissemination**
Technology initiatives should be evaluated in terms of its effectiveness in creating significant outcomes in the program areas of the initiative. Focus groups, observations, and surveys can be used to collect data. These data can also be included in the creation of institutional assessment reports in relation to the accreditation efforts. Research and dissemination of results to a broader audience (conferences and publications) should also be considered and the institution should create benchmarks based on these empirical data.

An Academic Technology Initiatives Plan

Literature shows that best practice in faculty development in instructional technology is most likely to be found in institutions that have a culture pervaded with technology (Bates, 2001). The indicators of success at the institutions that thrive in this area are:

a. A systematic academic technology plan
b. Extensive investment in technology infrastructure
c. Support from senior leadership for the use of technology in teaching
d. Support for faculty members in terms of project funding, release time, technical support, computer upgrades, and faculty development
e. Support for students through computer access, Internet accounts, and financial support

As can be seen, it is of utmost importance to create a plan and obtain strong buy-in from the institution administration and faculty representatives. One strategy to obtain buy-in for the initiative is to include data collected from faculty and students in relation to technology in teaching and learning and addressing these issues specifically in the plan. Table 1 presents an example of issues cited on a campus and how an academic technologies plan can address these issues.

No Technology in the Classroom: Paradox or Paradigm Change

If the faculty seem to be show-stopper of the technology initiatives, what of we advocate no use of technology in the classroom? If the average faculty member's nightmare is to walk into the classroom and face technology problems, with nobody to help or no time to fix the issues, what if we ease their pain and create a plan for “No More Technology In the Classroom”. This plan would remove the necessity of use of technology in the classroom, while equally offering the benefits of technology in terms of increasing student learning outcomes, motivation and engagement.

This creative and innovative plan would obviously aim to change the way faculty (and maybe all of us) think of technology use for teaching-learning process and strictly advocate a paradigm change of the way faculty teach. Technology would be used heavily outside the classroom whereas the classroom itself becomes a place for nothing more than a whiteboard or easel board. In this paradigm, the instructor would create learning materials (text, video, audio) for use outside the classroom, with ample time and support to work with technology. Students also would review these materials on their own time, as many times as they want. In the classroom, on the other hand, "active processing of information", which traditionally is expected to take outside the classroom is carried out through solving problems, interaction with peers, with the instructor, and in teams. This change of paradigm of technology use (not in the classroom, but outside) will have the desired impact of technology on enriching student learning, at the same time relieving the instructors of the constant worry of failing technology and losing precious lecture time.
<table>
<thead>
<tr>
<th>Issue commonly reported</th>
<th>How academic technologies can address</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classroom management/classroom etiquette issues (cited by faculty)</td>
<td>Create an active and interactive learning environment where students have to take charge of their learning. Carry passive listening of the lectures to outside of the class by making lecture materials/videos available. Use class time for discussions, problem solving, assessments</td>
</tr>
<tr>
<td>Students unprepared for demands of college; lack time management skills (cited by both faculty and students)</td>
<td>Create an online course calendar to help students manage their course activities; publish an online detailed syllabus; use announcement tools to communicate important information</td>
</tr>
<tr>
<td>Poor use of PowerPoint or other technology by faculty (cited by students)</td>
<td>Instructional technology training; best practices and idea sharing among faculty members; help with instructional materials development Topical workshops on effective use of PowerPoint and other instructional technology options</td>
</tr>
<tr>
<td>Faculty having little or no eye contact with students (cited by students)</td>
<td>Spend less time writing on the board and more time interacting with students, answering questions -- by making course materials available for students to study before the class (rather than creating these during the class)</td>
</tr>
<tr>
<td>Lack of interaction among faculty</td>
<td>Faculty learning communities, lunch discussion groups, and individual consultations</td>
</tr>
<tr>
<td>Faculty development position</td>
<td>Academic technology plan can be expanded to include a faculty development staff position; or this initiative can be co-owned by the faculty development office and academic technologies office.</td>
</tr>
</tbody>
</table>
Conclusion

Even the institutions with a cutting edge infrastructure struggle with introducing and sustaining instructional technology initiatives due to lack of planning, insufficient support from administration, inadequate support for faculty and students, or due to a lack of collection of data to showcase as indicators of success (or to point to areas of improvement). Academic technology offices should carefully consider all these factors to sustain technology use in the teaching-learning process and to keep faculty on board with these initiatives. The goal is not to equip rooms with the most expensive equipment and to obtain the most complicated solution campus-side. The goal is to use technology in a pedagogically and andragogically sound way to increase the outcomes of instruction. And this technology does not always have to be in the classroom as learning can be supported and occur anytime, anywhere.
References


Intelligent Tutoring Tool for Problems with Qausi-Hierarchical Solution Process Structure

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Abstract
This paper presents the conceptual design and implementation of a web-based e-learning tool that provides predefined or generates new e-learning exercises consisting of a calculation schemes. Learner’s solutions are automatically marked without intervention of instructors. The e-learning exercises can be characterised as follows: Because of the calculation scheme, there is a step-by-step solving process. Among the calculation steps there is a partial order that leads to the fact that there exist several different possibilities to solve an exercise. Besides, there may exist several dependencies between the results of different calculation steps. Therefore, when automatically marking a learner’s solution it is necessary to consider the structure of the solution and to retrace the solution process in order to find consecutive faults. That allows analysing exactly the strengths and weaknesses of the learner’s knowledge to enhance his learning success. Within the e-learning tool, it is possible for instructors to define exercises on their own. But the exercises can also be generated automatically based on the underlying problem specification and the user’s abilities that are stored in a user database. The advantage of such an e-learning tool is evident: Learners can practice whenever and wherever they want to. They get immediate feedback and instructors are relieved from routine jobs like designing exercises or marking solutions.

Keywords: Tutoring tool, E-Learning, web-based learning, automatic marking, online practicing, randomly-generated exercises

E-Learning Exercises Requirements
A very important challenge in e-learning consists of the provision of an integrated, largely automatic learning environment for interactive user-oriented learning. Such an integrated e-learning system should provide sophisticated tutoring tools that allow learners to deepen their knowledge (see Siepermann et al. 2008, p. 5302). This can be done by practice-oriented exercises that are adjusted to the learner’s knowledge. When solving an exercise the solution process should be traced and analysed in order to get information about the user’s current state of knowledge and his deficits to be improved. In many fields of application the structure of the solution process consists of a set of procedures that have to be solved in a partial or dered sequence. That means the necessary input data of a solution step depends on the calculated output data of other, preceding procedures. Mistakes made in previous steps will cause differences to the reference solution and therefore consecutive faults in the following steps. The e-learning system we will present in this paper provides the following features:

• An automatically generation of different types of exercises
An interface for solving exercises including support of the solution process

An automatically marking of exercises and a solution report to the user

A suited e-learning environment should base upon the interactive and multi-media based World Wide Web that offers various possibilities for e-learning exercises and tools. One part of such an e-learning system is that students can practice with sophisticated exercises in an interactive way (see Haack 2002, p. 129; Weidenmann 2002, p. 57) so that they have to find the answer on their own by using the learned approaches and their own knowledge. The exercises should not only be composed of simple forms like multiple choice, true-false questions, jumbled sentences or fill-in-the-blank. In these cases, the practicing students don’t really need their knowledge because often they easily can guess the correct answers by systematically reducing the number of possible answers (see König 2001, p. 112). Good exercises that really help students understand the contents of lectures should not contain the answer in a more or less apparent form.

Unfortunately, although such interactive exercises are welcomed and also demanded by students (see Glowalla et al. 2004, p. 61) they either do not exist or are very seldom in e-learning because of their complexity. In most cases, those exercises are still corrected by human beings today (see Kwan et al. 2004, p. 177; König 2001, p. 111; Schlageter & Feldmann 2002, p. 350 et sqq). Thus, it is recommended to develop tutoring tools that accomplish with the following three requirements (see Siepermann 2005, p. 1751):

- The exercises are more complex than multiple choice, fill-in-the-blank etc.
- They allow students to really apply their new knowledge.
- They give feedback in a predictable time.

Therefore e-learning exercises should not prescribe the problem-solving procedure. Instead, they should allow many degrees of freedom to get to the right answers. Limitations should only appear if they are necessary to implement online exercises. Furthermore, e-learning exercises should be marked automatically, so that the students immediately get feedback concerning their given answer (see Bolliger & Martindale 2004, p. 62; Issing 2002, p. 162; Kobi 1975, p. 65; Strzebkowski & Kleeberg 2002, p. 230). Due to the various degrees of freedom, this task is quite difficult to accomplish because often there is not only one correct answer but several answers that are more or less correct. Thus, we have a scale of correctness concerning the answers, not only whether they are correct and false (see Siepermann & Lackes 2007, p. 13). This circumstance is evoked by consecutive faults and high complexities of exercises and topics. For all this we cannot create an overall type of e-learning exercise with which all possible kinds of topics can be practiced. Instead, we have to create exercises that are specialised in a certain topic or in a certain type of problem. Therefore, we firstly classify the types of problems and afterwards we create a special tool for each class. In the following, we will focus on one class that can be as follows:

- The underlying problem can be depicted as a formal concept.
- It consists of numeric operations.
- The steps of solution process are partial ordered.

The underlying concept of the intelligent tutoring system we will present is that general concerning the generation and marking of exercises that different topics can easily be covered. When creating exercises for new topics simply the terminology has to be
adapted, the solution steps have to be determined and the structure of solution scheme has to be defined. For this reason, it is recommended to design e learning tutoring tools as modular systems so that single modules can be reused within other exercise types.

To illustrate the concept and the features of the tutoring tool, we focus on a special field of application: The material management in the production planning of modern business information systems. In this field, many numeric problems arise that possess a partial ordered solution structure. Explicitly, our intelligent tutoring tool provides exercises to students concerning the net requirements calculation in production planning systems. This calculation, which is based on a relatively simple table structure (see figure 1), determines the quantity and points in time of products and parts that a manufacturer has to produce or to order within its planning horizon. (see Fandel et. al. 1997, p. 158 et sqq.; Lackes 1998, p. 293 et sqq.) Similar topics in the field of production planning are for example lot size planning, investment planning, cost calculation etc.

Application

The net requirements calculation as a part of the production planning determines the amount and points in time of products and parts that a manufacturer has to produce or to order within his planning horizon. (see Fandel et. al. 1997, p. 158 et sqq.; Lackes 1998, p. 293 et sqq.) Within the net requirements calculation we distinguish three kinds of parts: End products, assembly groups and single parts. All kinds of parts may possibly be sold on the outlet. Sales orders and stock orders together determine the primary requirements (row 1) of each saleable part, which are the starting point of the calculus.

### Table 1: Scheme of net requirements calculation

<table>
<thead>
<tr>
<th>Part No.</th>
<th>EP1 Period</th>
<th>AG1 Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Primary requirements</td>
<td>150</td>
</tr>
<tr>
<td>2</td>
<td>+ Dependant requirements</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>+ Expansion requirements (10%)</td>
<td>15</td>
</tr>
<tr>
<td>4</td>
<td>= Gross requirements</td>
<td>165</td>
</tr>
<tr>
<td>5</td>
<td>Warehouse stock</td>
<td>320</td>
</tr>
<tr>
<td>6</td>
<td>= Safety stock</td>
<td>20</td>
</tr>
<tr>
<td>7</td>
<td>+ Released orders or open purchase orders</td>
<td>140</td>
</tr>
<tr>
<td>8</td>
<td>– Reservations for released orders of superior parts</td>
<td>0</td>
</tr>
<tr>
<td>9</td>
<td>= Disposable stock</td>
<td>440</td>
</tr>
<tr>
<td>10</td>
<td>Net requirements (4–9)</td>
<td>0</td>
</tr>
<tr>
<td>11</td>
<td>Lot-sizing</td>
<td>0</td>
</tr>
<tr>
<td>12</td>
<td>Partial dependant requirements for inferior parts</td>
<td>0</td>
</tr>
<tr>
<td>AG1</td>
<td></td>
<td>3320</td>
</tr>
</tbody>
</table>

*Fig.1. Scheme of net requirements calculation*

End products and assembly groups are manufactured by using assembly groups and single parts, single parts are built by using raw material or are purchased. The relations between end products, assembly groups and single parts can be described in a so-called gozintograph (see figure 3). Each node represents one part, the edges between the nodes indicate the relations between the parts: E.g. the superior part AG1 is manufactured by
using two (the first number on the edge) inferior parts SP1. This number is called production coefficient. The second number on each edge (the forerunning time displacement) indicates the period of time between that point in time the production of the superior part is finished and the need of the inferior part to manufacture the superior part. The cumulative amount of an inferior part that is needed in a period to produce all the direct superior parts is called dependent requirements (2).

![Gozintograph](image)

Fig 2. Gozintograph

Summing up rows 1 and 2 and adding a percentage, the so-called expansion requirements (3), we get the gross requirements (4). This is potentially covered by warehouse stock (5), released orders or open purchase orders (7). This potential coverage is reduced by safety stock (6) and reservations for released orders of superior parts (8). Summing up rows 6 to 9 we get the disposable stock (10) that can be used to cover the gross requirements. If the disposable stock cannot completely cover the gross requirements, the difference between gross requirements and disposable stock build the net requirements (10). Due to economical considerations, the net requirements of each period can be combined to reduce production and delivery costs. This operation is called lot-sizing (11). After lot-sizing we multiply the lot size of each period with the corresponding production coefficients to get the partial dependant requirements for each inferior part (12) that has a direct production relation to the calculated superior part. Having calculated each superior part of an inferior part, we sum up every partial dependant requirements to get the total dependant requirements of the inferior part (2).

**Objectives**

The problems the intelligent tutoring tool can deal with can be described as follows:

1. There are a lot of basic terms that have to be provided with valid raw data (variables).
2. Assigning a value to a variable can be defined as a solution step.
3. The calculation steps of the solution process build a partial order. That means that when calculating the value of a variable other values of variables are necessary for this calculation and have to be calculated before.
4. The connection between variables does’t only consist of a simple calculation rule. Additionally, the values of variables may have to fulfill several side constraints that depend on the values of other variables.
5. There are side constraints concerning the values of variables that have to be kept. Some side constraints are very strict and may not be violated others may be violated within certain limitations.
6. The output data of a calculation step can determine the input data of following calculation steps; that means incorrect data implies consecutive faults.
7. A solution step can be a simple calculation function (i.e. addition, multiplication) or a complex optimisation procedure (i.e. lot sizing).
Now, the main purpose is to provide a collection of exercises that students can use to practice on their own. Therefore, the e-learning system has to support:

- the definition of interactive exercises of different types,
- the solving of exercises including support of the solution process,
- the administration of students and exercises, and
- the archiving of exercises and solutions made by students.

All this should be done via the Internet so that students can practice wherever and whenever they want to. But besides the provision of exercises, some additional purposes are pursued:

- A sophisticated way of practicing
- An automatic generation of exercises
- An automatic marking of students’ exercises

The first purpose deals with the type of exercises. Students shouldn’t be able to guess a solution. Therefore, it is not only the final result that counts, but also the way students have arrived at their results. Unlike the intelligent tutoring tools of the Byzantium project that provide multiple ways of how to reach a correct solution (see Patel & Kinshuk 1996, p. 141), the Bru-N-O’Mat doesn’t prescribe any solving procedure. Students have to build their own calculus without predefined tables or captions. Therefore, the intelligent tutoring tool not only has to verify the values the students have calculated but also their way of solving the exercise, i.e. have they used the correct technical terms with correct meanings and correct relations within the parameters? The second purpose is always a very difficult task. But to provide diversified exercises, an automatic generation of exercises would be a great advantage for practicing. The third purpose is of very high importance. An automatic marking guarantees a quick response and feedback. In contrast to human lecturers, an e-learning system can mark a solution within seconds and can give hints as to what lecture topic should be revised. Furthermore, when providing an automatic marking, human lecturers are relieved from routine jobs and can concentrate on more important jobs. Despite the »simple« calculus, building feasible and suitable exercises, as well as marking the student’s solution automatically, is a quite complex and difficult challenge.

**Architecture**

Within the whole system, we can distinguish three different tasks. The first task deals with the provision of exercises. There, we have to meet several requirements. First of all, the tutoring tool should provide the option of defining, storing and managing exercises and versions of exercises to lecturers. Those exercises could be of three types:

- Simple exercises
- Timed exercises
- Exam exercises

Simple exercises are ordinary exercises that can be solved by students. They consist of a description and an editor. Timed exercises additionally provide the target time of the exercise. That helps to prepare for exams because now students know if they are quick enough. Exam exercises also provide the target time, but unlike timed exercises after the target time has run out, students cannot continue with exam exercises anymore. Furthermore, all exercises are classified by different difficulty levels, since the difficulty of exercises should be suitable to the students’ level of knowledge. Therefore, it is essential that students be able to choose among several difficulty levels of exercises in order to gain a high acceptance of exercises by students. Apart from the definition and provision of predefined exercises, the e-learning system also provides self-generated exercises without
any intervention of lecturers. This task is one of the most difficult tasks of tutoring tools. Despite the relatively simple table structure, the complexity of exercises concerning the net requirements calculation is very high because there are several interdependencies between variables that have to be taken into account and it can be difficult to generate valid values. As well, the generated values have to fulfill several conditions so that a calculation can take place. For example, it is recommended that the warehouse stock not cover all gross requirements because otherwise lot-sizing won’t be necessary. All these conditions have to be considered when generating an exercise. The generated exercise must be feasible and suitable at the same time.

Furthermore, for each exercise the target time has to be calculated and the exercises have to be classified by a difficulty level. The target time can be calculated by counting all necessary table entries and considering the difficulties within an exercise. Therefore, the difficulties have to be parameterised. This parameterisation can also be used for the classification of exercises concerning the difficulty level.

The second task – practicing with exercises – first of all focuses on usability. No system will gain acceptance without a minimum of ergonomics and user friendliness. For this reason, all exercises, except for exam exercises can be saved at any time and can be continued later. It is possible to export the solutions to a standardized format like CSV or MS Excel.

But the practicing task mainly focuses on how students achieve their answers instead of the final results of their calculation. The advantage of this approach is that students cannot guess the correct answers. They have to know the correct way of solving the problem. This implies that if students have managed to solve an exercise they have understood the underlying problem instead of memorizing facts and solutions. Therefore, the system provides interactivity and many degrees of freedom when solving an exercise. Aside, regarding some special topics the students are allowed or rather encouraged using external instruments to solve an exercise, for example, when calculating the net requirements the lot-sizing should be done externally.

However, the various degrees of freedom lead to a higher complexity of exercises so that the automatic marking of exercises – the third task – is quite difficult. Focusing on the way students solve an exercise, this means that a simple comparison between the values students have calculated and the reference values won’t be sufficient. Therefore, the user interface and the marking algorithm have to be very tolerant concerning mistakes so that a mistake committed in the beginning of an exercise won’t lead to an abnormal termination. Within a calculation it is evident that the automatic marking is able to analyse the solution in order to find consecutive faults. If every mistake a student has made is marked as incorrect the motivation of students will decline because of the mass of mistakes. Therefore, consecutive faults are identified and not marked as incorrect.

Furthermore, the intelligent tutoring tool not only points out the mistakes made by students but also the corresponding topics that are obviously not understood. The advantages of such an automatic system are evident: Students get a qualified feedback immediately. Lecturers are relieved from marking students’ solutions and modal fragmentation won’t occur so that transmission errors between media are reduced.

Figure 3 visualises the main parts of the architecture of this e-learning concept. It consists of

- an exercise administration module,
- a user administration module,
• an exercise generation module,
• a master database and a rule database,
• a configuration module,
• a content module and
• a representation module.

The exercise administration module stores and manages the exercises predefined by lecturers as well as the automatically generated ones. All exercises are classified according to their difficulty level. The difficulty level results from the different accounting methods and the calculation components which occur in an exercise. The user administration module manages every single user. Every user can act in different roles: Students can practice with exercises, automatically generate exercises and have a look at the marking of their solutions. Lecturers can predefine exercises or automatically generate them, work on exercises like students and have a look at students’ solutions to gain an insight into student’s knowledge. Administrators assign roles to each user, work on fundamental system parameters and adjust the parameterisation of the difficulty levels. The solutions of users are also stored in the user administration module.

The exercise generation module can be used by students and lecturers. Students can choose a difficulty level and choose whether they want to work on that exercise in the exam modus or not. Lecturers as well can automatically generate exercises and select a difficulty level. Additionally, they can in- or exclude single parameters to create a more specialised exercise. The generation module provides an exercise according to the chosen preferences and calculates the target time for solving with regard to the difficulty parameters. The exercise is generated with respect to the master data stored in the master database and to the rules stored in the rule database. The lecturers are able to add master data and rules to these databases via the configuration module.

After the expiration of the target time (if the exam modus was chosen) or after the exercise has been finished by the student, the solution is sent to the marking module. This module evaluates the solution using the rule database, marks right and wrong elements and gives hints as to which lessons should be repeated via the content module. The exercise is represented via the representation module.

The presented e-learning system is a client-server-based system, developed with classical web technologies. Work on exercises and therefore exercise representation takes place at the client. The frontends of the administrative modules also run at the client side. All other modules are only operated on the server side.
**Functionality**

When using the platform in order to apply their knowledge concerning the net requirements calculation and order planning, students have two choices:

- Solving exercises defined by lecturers e.g. old exam exercises
- Creating and solving randomly generated exercises.

Irrespective of the chosen exercise, predefined or randomly generated, the interface to solve an exercise remains always the same (see figure 4). The table structure they need to solve the problem is not given but has to be created at the start of each exercise. Students can add or delete rows and columns of the table and the captions are not given. Instead they have to name each row and each column on their own. All needed initial values are given within the exercise description. The exercise description may vary concerning the presentment. The relations between parts, the forerunning time displacements and the production coefficients can be displayed using a simple table or the gozintograph as graphical representation. Within random exercises or while creating a predefined exercise, the gozintograph is computed automatically out of the given values. Other values can also be described textually or within tables or graphics. There is no restriction concerning the exercise description students will see.

Depending on the given values, student must determine the number of periods, the rows he needs within the net requirements calculation and so on. Depending on the required algorithm, the lot-sizing is one of the most complicated tasks because it has to be done by students without any help from the
program. They have to calculate the lot-size outside the program on their own and then use the result within the net requirements calculation. While solving an exercise, students can save their partial solution and quit the program. They can return to a saved exercise and resume it. After finishing, they send their solutions to the system, which automatically marks the solutions and shows all mistakes students might have made. Furthermore, the total time students needed to solve the exercise is displayed and compared to the target time.

Lecturers too can solve exercises they created or which the systems generated automatically. Additionally, they can use the system to solve a predefined exercise in order to check if all parameters are correct and given. Furthermore they can generate random exercises by defining precisely which complexity parameters the exercise should have. This helps to define classic exam exercises that are still the status quo at German universities. Besides this, lecturers administer the predefined exercises. They can change existing exercises because of typing errors, problems in understanding and so on.

Additionally, each exercise can be activated within a certain period of time. Within this period, the exercise can be solved by students. Before this period, the exercise won’t be shown to students. Afterwards the exercise is shown, but cannot be solved anymore. Students who have solved the exercise only can view their own solution and the reference solution.

**Random Exercises**

In case of randomly generated exercises, students first have to choose the difficulty level the generated exercise should have. They can choose between three levels: Easy, normal and difficult. The definitions of difficulty levels are predefined within the tool and can only be changed by lecturers. We can distinguish two kinds of difficulties:

- The quantity and
- The complexity of an exercise.

The quantity of an exercise depends on the amount of different variables that have to be considered (e.g. the number of products and periods of the planning problem). It has nothing to do with the difficulty of an exercise. The difficulty is determined by the complexity of the content of the exercise. The
complexity depends on the demanded solution model, the solving procedure to calculate the values of the variables and the instruments provided by the system to solve the problem. In our special application field this complexity is determined by the following parameters:

- Which parameter has to be used in content?
- Is the forerunning time displacement given as is or does it have to be calculated by using the lead time and the processing time?
- Are the primary requirements given or are they given as sales orders and sales forecast?
- Which lot-sizing algorithms have to be used (e.g. Wagner-Whitin)?
- Are there partially dependant requirements for inferior parts that affect former periods?

Each complexity parameter is assigned to a percentage that represents a complexity. Summing up all percentage values, we get a difficulty level of 100 percent. Each difficulty level is now assigned to an interval between 0 and 100 percent. The percentage of each parameter and the percentage boundaries of each difficulty level can be defined by lecturers but not by students. Now, when students choose a certain difficulty level the system chooses the complexity levels at random such that the sum of their percentages lies between the boundaries of the chosen difficulty level. The target time of an exercise results by a combination of quantity and complexity measures.

After that, the tutoring tool creates random values for the chosen parameters. But due to interdependencies between some parameters of the net requirements calculation, not all values can be computed at random but have to be internally calculated. For example there is a relation between released orders or open purchase orders of superior parts, reservations of inferior parts for released orders of superior parts and the corresponding lead time, processing time and forerunning time displacement. These interdependencies have to be taken into consideration when generating and calculating values for each parameter. Furthermore, it has to be taken into account that the warehouse stock, for example, doesn’t cover the gross requirements in all periods. Besides, the net requirements have to be chosen in such a way that there will be some lot-sizing. Therefore, the chosen lot-sizing algorithm, which may vary from part to part, has to be considered as well.

**Marking of Exercises**

An automatic marking is of high importance because it guarantees a quick feedback. The type of exercises we are discussing mainly consists of calculation schemes whose steps build a partial order. For example, the net requirements calculation is a deterministic calculus with few degrees of freedom. What can be varied are the order of some calculation sequences and the use of correct or wrong captions. Concerning the calculus we observe a hierarchical order of calculation steps within the calculation scheme. Therefore, we can build a directed and hierarchical calculation tree with some parallel branches. In this calculation tree the variables and the functions are represented by the vertices and the connection between them by edges. Each function vertex is the parent node of at least two edges leading to two variable vertices. Because a variable can be the result of a calculation step, a variable vertex is the parent node of one edge leading to a function vertex (see figure 5).
With the help of this calculation tree the student’s solution can be compared to the reference solution and therefore marked automatically. Within the automatic marking we have to consider three aspects:

- Caption faults
- Content faults
- Arithmetical faults

Caption faults only occur in the header of a column or row. In order to detect mistakes in writing e.g. safety stock, we have implemented a tolerant word recognition that not only accepts the correct words but also some minor mistakes in writing. Due to this procedure the exercises only provide that information which is needed to solve the problem, but nothing else like the needed scheme. Another problem consists in homonyms. But as the most calculation schemes use a small set of words with fixed meanings, this problem can be solved with a list of possible homonyms.

Content faults arise when the sequence of the half-ordered calculation step is not recognized or the solution model resp. the calculation scheme is unknown or the necessary solution steps are incomplete. They are made because students for example don’t know how to calculate the net requirements correctly. This leads to incorrectly used values. In this case, the values in the variable vertices of the student’s solution differ from the reference solution. These vertices have to be marked as incorrect and the marking algorithm has to consider these incorrect values in his further steps.

Arithmetical faults arise when students know about the correct calculation scheme but execute the single steps in a wrong way. In this case, the edges between the vertices are incorrect and lead to faulty results. For example, students don’t add up some values in a mathematically correct way. In some cases it is not easy and unambiguous to decide which kind of mistake is on hand. Perhaps, a faulty calculation result is caused by lacks of understanding or application errors. Or there is a mixture of all kinds of faults.

Irrespective of the faults that occur, the student might have chosen the correct way of calculating the net requirements. Therefore,
all faults have to be taken into account. Thus, the marking algorithm can be realised as a simple depth first search. It checks one value in a variable vertex of the student’s solution. If it is correct, the algorithm proceeds with the next value. If not, the algorithm has to mark the vertex and memorizes the mistake. The mistake is used within the reference solution in order to consider consecutive faults. Therefore, we need to calculate the result with the help of the reference solution tree but with the values used in the student’s solution. When proceeding to the next value, the algorithm now has to check this next value considering the previously made mistakes in order to find consecutive faults. There are three possibilities concerning the next value:

- The next value is correct with regard to the reference solution.
- The next value is correct with regard to the previously made mistakes.
- The next value is completely incorrect.

In the first case, the checked value is correct and nothing has to be done. In the second case, the value is a consequence of a previously made mistake and has to be marked as a consecutive fault. In the third case, the value has to be marked as incorrect. After the marking algorithm has finished, the marked solution is displayed to the student. The reference solution that is also calculated automatically can also be viewed by the student. Further on, an intelligent tutoring tool not only points out the mistakes made by students but retraces and analyses the student’s solution process. Based on this analysis hints are created to the corresponding topics that are obviously not understood.
Conclusion

Even if classical lectures are often criticized, students mostly prefer this form of teaching (Glowalla et al. 2004, p. 58) and don’t want them to be replaced by electronic lectures (Bruns 2002, p. 19). Therefore, e-learning should not be a replacement but an additional feature of classical lectures. Thus, the development of the intelligent tutoring tool we described above had two purposes:

- Providing exercises so that students can practice on their own, when and where they wish to and without the need of a supervising lecturer who has to mark the students’ solution.
- Relieving lecturers from marking students’ solutions in order to save time. This time can be spent to support gifted students or to take care of less talented students who need more help than other students.

Both purposes have been reached. With this intelligent tutoring tool lecturers can provide exercises so that students can practice and prepare for exams. The three major benefits are that, firstly, because of the automatically generated exercises students can exercise as often as they want to and no exercise will be the same. They can achieve a self-steered learning which is one of the most efficient ways of learning (Kerres & Jechle 2002, p. 272). Secondly, the students’ solutions are marked automatically without any intervention of lecturers. Therefore, lecturers now save time that they can spend more dedicatedly than before. Furthermore, the system can be used to create classic exam exercises and therefore, again, this saves time and reduces errors in exams. Thirdly, the exercises don’t tell students how to solve the problem so that students really have to apply their knowledge instead of guessing or simply calculating a result.

The intelligent tutoring tool is now ready to use. What has to be done is a linking to the topics of a lecture in case the student has made any mistakes. Furthermore, the mistakes made by students can be analysed in a more detailed way. Because of interdependencies between several parameters, we can distinguish if a student has a deficit in content or if it is only a slip. Due to the sophisticated parameterisation the program can easily be adjusted if new demands appear. Furthermore, the difficulty levels and complexity parameters can be adjusted if it turns out that their significance has not been estimated correctly. Because of its open architecture, the system can easily be extended so that other kinds of calculation can be implemented for practicing.

There are some interesting future prospects that should be pursued to improve the e-learning system. First of all, we will integrate adjusted and customized tutorials for learners that address exactly to the gaps in their knowledge. Furthermore, a more sophisticated fault analysis should be implemented to decide more exactly about the learner’s level of knowledge. Secondly, we will focus on an enlargement of content. It is obvious that neighbour topics (e.g. lot sizing, capacity planning etc.) should be integrated in order to offer a complete planning situation.

A higher quality in e-Learning could be reached if the relevant data needed to solve an exercise isn’t completely described in the exercise but in a knowledge data base. Then, students have to decide which data is useful for the solution process before consulting the data base. Thus, they must know the relevant questions in order to get the relevant data.
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Learning Styles Inventory: A Diagnostic Questionnaire for Construction

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Abstract

Learning styles theory is widely acknowledged amongst educational theorists. However, there is little research evidence on the adoption and adaptation of learning styles in an e-Learning environment, specifically in respect of personalised learning environments. In this context, evidence identifies that the more thoroughly instructors understand the differences in learning styles, the better chance they have of meeting the diverse learning needs of learners. In this respect, providing learners with learning environments that suit their learning style can have a positive impact on learning effectiveness. Many learning styles inventories/instruments have attempted to augment learners’ learning styles with learning methods, albeit without taking on board the criticism levied at inventories and similar instruments in terms of reliability and validity (including the rubrics behind the models of learning styles). This paper identifies the process of amalgamating three existing models of learning styles (Kolb; Honey and Mumford; and Felder and Silverman), into a ‘Diagnostic Questionnaire’ learning style inventory for reflection and discussion.

Keywords: learning styles inventories, models of learning styles, personalised learning environments, e-learning

Introduction

Although learning styles (LS) and their effect have been mentioned as a complex research field (Coffield et al., 2004); these individual differences are still considered to be important in the field of education (Manochehr, 2006). Research on LS has consistently shown that incorporating personality attributes (i.e. learning styles) into delivery media can significantly improve the learning process (Dwyer, 1998). Moreover, a previous study undertaken by Lindsay (1999) found that a match between learning styles and teaching style increases a learner’s achievement and satisfaction. Although some psychologists (Holodnaya, 2002) consider learning in mismatched conditions in some cases to be beneficial in the sense that it helps to develop new skills; it is also considered that the application of LS in the wider context of learning per se needs further research (in order to fully appreciate the nuances and interrelationships further).

Even though the LS theory is widely accepted amongst educational theorists in the context of traditional classroom environments, there is still little research done on the adaptation to individual styles in an e-Learning environment. In view of the fact that e-Learning has influenced the field of teaching, training and development, and has augmented a growing number of courses over the web, with an increasing number of students (Chang, 2001); however, LS have not yet
been fully incorporated into these environments. LS research has formed the basis for the development of a number of personalised learning systems, and a number of studies have shown that they can adapt to the individual’s learning style, which can have a positive impact on learning effectiveness (Karagiannidis and Sampson, 2004). This has also been highlighted by Buch and Bartley (2002) in an earlier study by stating that learning environments which are not consistent with an individual’s style are more likely to be rejected or resisted by the individual. The study concluded that learning styles should be taken into consideration in decisions regarding the use of the many delivery mode options today. In addition, Bajraktarevic et al., (2003) stated that a number of researchers have promoted approaches to the design of computer-based learning materials (addressing the issue of tailoring the design of learning activities to match individuals’ learning styles); hence, these core issues justify the significance of incorporating learning styles into a learning environment, of which is the core raison d’être for this research.

This paper describes the development of a Diagnostic Questionnaire (a newly enhanced LS inventory). This questionnaire forms the basis of future research leading to the development (PLE) prototype. As such, this research discusses the rubrics and modus operandi of this questionnaire as an approach to direct learners into a Personalised Learning Environment (PLE) prototype. This paper is designed to only highlight the development part of the diagnostic questionnaire and not the PLE prototype.

**Background Research**

The concept of learning styles should ideally be addressed within all learning environments. There is no single way, however, to describe learning styles, as a number of definitions appear in the literature (Sampson et al., 2002). For example, Conner (2005) defines learning styles as “….the ways you prefer to approach new information”. Kolb (1976) saw learning styles as “the unique learning method presented by the learner during the learning process and situation” while Dunn (1990) described learning styles as “….the way each learner begins to concentrate, process and retain new and difficult information”. In addition, Honey and Mumford (1992) defined learning styles as “…..a description of the attitudes and behaviour which determine an individual’s preferred way of learning”. Moreover, Felder (1996) describes learning styles as “a person’s characteristic strengths and preferences in the ways they take in and process information”.

The predominant aim of any e-Learning programme is to ostensibly help learners achieve the prescribed learning objectives (Larocque and Faucon, 1997). Thus, in a traditional classroom environment, the instructor should guide the learners towards the objectives through a variety of teaching strategies and learning activities; which is in contrast with e-Learning. Due to the independent learning in e-Learning, the learners need to be more self-motivated and self-directed in order to achieve the objectives of the programme; therefore, the responsibility for learning is transferred from the instructor to the learner (Martinez, 2002). In this context, there is no single right way to teach; many instructors naturally confine their teaching to the method that reflects their own learning style to the exclusion of others (Entwistle, 1981; Davidson et al., 1999). Smith and Kolb (1986) argued that learners may reject a learning environment that does not match their learning styles. Williams (2002) supported this by pointing out that designing a learning environment that accommodates learners’ LS is essential for effective learning.
Several e-Learning systems that adapt learning styles have been developed over the past number of years (Carro et al., 1999; Martinez and Bunderson 2000; Corso et al., 2001), but what remains unclear is what aspects of learning style profile are worth modeling and which the most effective approach for a particular style is. Although learning style theory is widely accepted amongst educational theorists in the context of traditional classroom environments, there is still little research on the adaptation to individual styles in a web-base learning environment. Nevertheless, there are a number of systems have been implemented recently to provide support for LS; whereby the implementers of the systems choose a particular model of learning styles and implement the corresponding LS into their systems (Stash et al, 2004). In the context of this research, it was felt that the module within an e-Learning environment would be enhanced by adopting a model of learning styles which better reflect the learners’ needs. Upon the formation of the newly proposed model of learning styles, a Diagnostic Questionnaire was developed to classify a learner’s LS preference. This questionnaire was developed on the premise that each learner has an individual learning style profile (Wolf, 2002) and that learning styles are ‘predictable’ and ‘stable’.

The development of technology-enhanced learning is continually evolving, and, with the advent of digital age the learning industry has experienced a major paradigm shift over the last decade in e-Learning (Venkatachary, 2002). This rapid development has placed educational environments in a state of flux (Andrews and Crock, 1996) as institutions strive to embrace these opportunities in order to innovate and dispel the conventional ‘intractable’ conditions for learning (Benesova et al., 2002). Such conditions include the concept of synchronous communication; inflexible learning geared to a specific timeframe; high learner to instructor ratios; expensive materials, etc. Within the context of a PLE, e-Learning involves different aspects of using e-documents for learning related activities. It tends to embrace such issues as managing curriculum courses on the Web (advertising, registration, scheduling, exams, etc.), through to online publishing, tutorials, assessment, etc. In this respect, specific efforts have been made to create high-quality and relevant online learning material, as well as the support infrastructure (to support and facilitate the learning process). Within the context of learning per se, learners often have different levels of motivation, different attitudes about teaching and learning, and different responses to specific classroom environments and instructional practices. Thus, the more thoroughly instructors understand these differences, the better chance they have of meeting the diverse needs of their learners (Felder and Brent, 2005). Furthermore, Karagiannidis and Sampson (2004) noted that there was a general shortage of evidence to back up the belief that e-learning provided real advantages - the assumption of which was that 'traditional' mode of instruction (one-to-one/one-to-many tutoring) could not fully accommodate the different learning styles, strategies and preferences of all diverse learners. Following this train of thought, research is now being undertaken on ‘adaptive learning environments’ that can personalise the learning experience (Sampson and Karagiannidis, 2002). In this respect, this research attempts to crystallise these thoughts into ‘tangible nuggets’ for discussion.

### Learning Styles Inventories (Instruments)

According to Hayes and Allinson (1996), Learning Styles Inventories and similar instruments are commonly used to match learners’ learning style with learning...
methods. There are several different instruments for measuring individuals’ learning styles (Kovačić, 2004). In the 1960s and 1970s, a number of instruments for measuring learning styles began to emerge (Williams, 2002); which most are based on self-analysis and learners’ perceptions of how they learn. The learning style instruments are fairly concise and simple to complete. According to Williams (2002), some learning style theories have been the subject of debate, and their validity has been questioned. From the early 1970s onwards, a wide variety of instruments for measuring a learners’ learning style preferences were developed – for example:

- Cranfield Learning Style Inventory (CLSI) – a 30 item instrument that measures a number of variables including preferences for listening, reading, iconic and hands-on-experience (Coggins, 1988).
- Kolb Learning Style Inventory (Kolb-LSI) – a 12 item self-scoring instrument in a form of ‘tick and flick’; defining four learning styles: diverging, assimilating, converging and accommodating (Kolb, 1984).
- Honey and Mumford’s Learning Style Questionnaire (H&M-LSQ) – which builds upon Kolb’s LSI; defining four learning styles: activist, reflector, theorist and pragmatist (Honey and Mumford, 1992).
- Gardner’s Multiple Intelligence – a 70 question multiple intelligence test.
- Felder and Solomon’s Index of Learning Styles (F&S-ILS) – a 44 item questionnaire which builds upon the Felder and Silverman model of learning styles.

Coffield et al., (2004) identified 69 models of LS that were “worthy” of consideration and further divided the family of learning styles into five main categories (Coffield et al., 2004). Nevertheless, the competing theories and techniques of measuring LS and the effectiveness of such measures are varied and contested that simple choices about the most suitable one are difficult to substantiate (Coffield et al., 2004). Moreover, for some researchers, a reliable and valid measure of learning styles has not been developed; and for some, the perfect learning style instrument is just a fantasy. Furthermore, Maochehr (2006) mentioned that not all researchers and writers agree with all the available models of LS. Due to these reasons, this Diagnostic Questionnaire is considered as a viable initiative in trying to fill in the gaps within the existing learning styles instruments available.

Learning styles research has formed the basis for the development of a number of personalised learning systems, and a number of studies have shown that they can adapt to the individual’s learning style, which can have a positive impact on learning effectiveness (Karagiannidis and Sampson, 2004). This has also been highlighted by Buch and Bartley (2002) in an earlier study by stating that learning environments which are not consistent with an individual’s style are more likely to be rejected or resisted by the individual. The study concluded that learning styles should be taken into consideration in decisions regarding the use of the many delivery mode options today. In addition, Bajraktarevic et al., (2003) stated that a number of researchers have promoted approaches to the design of computer-based learning materials, addressing the issue of tailoring the design of learning activities to match individuals’ learning styles.

Hence, these core issues justify the significance of incorporating learning styles into a learning environment. The incorporation of learning styles into a PLE has the potential of leveraging significant benefits, the novelty and timeliness of which is the core raison d’être for this research.

Research Methodology
The research methodology approach adopted for this paper embraces the distillation of core research material gathered from a detailed literature review. The literature review encompassed concepts and issues surrounding the development of a learning style inventory (Diagnostic Questionnaire), specifically within the context of the management and social sciences fields. A qualitative approach was used in this research, as this was considered more suitable for studying social and cultural phenomena (Berger and Luckman, 1966). The development of this questionnaire is divided into three stages. The first stage explores the families of LS as defined in the literature and identifies three models of LS based on the criteria set by DeBello (1990). Each characteristics of learning styles within the three models were identified. The second stage of the development amalgamates the similar characteristics of learning styles within the three models; teasing out four core themes (identified as Learning Style A, B, C and D). The final stage forms questions for each of the four core themes of LS. This questionnaire comprises of 24 questions; six for each core themes of LS.

Development of the Diagnostic Questionnaire

Criteria in Considering a Model of LS for the Development of the Diagnostic Questionnaire

According to Coffield et al., (2004), it is difficult to teach students if we do not know what their learning preferences are. In this context, this questionnaire aims to identify a learner’s learning style preference. The questionnaire was formed by amalgamating three models of learning styles determined from the literature; namely Kolb’s model of LS, Honey and Mumford’s model of LS and Felder and Silverman model of LS. It was formed with the basis that a learning style comprises the following activities:

- Perceive and process information (Kolb-LSI) (Kolb, 1984)
- Process and Organise information (H & M-LSQ) (Honey and Mumford, 2006)
- Process and Receive (or Remember) information (FS-ILS) (Felder and Silverman, 1988)

For the benefit of the readers, the three core models of learning styles were identified after a detailed synthesis of the literature review. These were considered the most suitable for this research, as being the most cited and commonly used in a web-based learning environment. In addition, some other factors were also considered, i.e. (i) reliability and validity of the models, (ii) widespread of use, and, (iii) the extensive research behind the models. Previous developed adaptive hypermedia environment incorporating learning styles; i.e. INSPIRE (Honey and Mumford model of learning styles), CS388, LSAS and Tangow (Felder and Silverman model of learning styles) have also incorporated the identified models of learning styles (Stash et al., 2004). Moreover, these models have been also successfully implemented in traditional classroom scenarios. These three models of learning styles were then amalgamated based upon their similarities in characteristics. According to DeBello (1990), there are a few factors that have to be considered before deciding on a LS instrument; such as (Syed-Khuzzan and Goulding, 2008a):

- Is the model and instrument reliable and valid?
- Is there widespread practitioner use?
- Is there extensive research behind the models?

Functionality of the Diagnostic Questionnaire
The rubrics and augmentation of the Diagnostic Questionnaire aimed to function as a learning styles inventory test which is formed to diagnose a learner’s learning style preference. This was developed from the amalgamation of three models of learning styles; namely Kolb model of LS, Honey and Mumford model of LS and Felder and Silverman model of LS. The amalgamation of the three models teased out four core themes of learning styles; identified as Learning Style A, B, C and D.

The main outcome of this questionnaire is to direct learners to an environment which ‘better’ suits to their own learning preference. Kwok and Jones (1995) have also carried out an experimental study with a computerised ‘front-end’ study preference questionnaire in order to suggest to the user a suitable navigation method through the system. As a result of their study; they found that students at the far extremes of the learning style spectrum needed the navigational guidance, and it helped them raise their interest in the materials.

Following also the theory of learning styles (Entwistle, 1988; Kolb, 1984; McLoughlin, 1999), how much individuals learns, i.e. the effectiveness of instructional manipulations, is mainly influenced by the educational experiences geared toward their particular style of learning. This questionnaire therefore serves as a ‘one-off’ activity whereby only first time learners would have to fill in all the questions to enable the system to capture and store their learning preference. This will form a ‘front-end’ to the PLE prototype that will be developed in the later stage of this research.

Development Stage 1:
Identification of the types of learning styles for all the three models of learning styles and each of their characteristics.

Development Stage 2:
Identification of similar characteristics of each learning styles in the three models and amalgamating them together, teasing out four core themes (identified as Learning Styles A, B, C and D).

Development Stage 3:
Identification of questions within the four core themes and constructing new questions which covers all three models (examples taken from Kolb-LSI, H&M-LSQ and F&S-ILS)

Development Stage 1
The first stage in the development of this questionnaire was to identify and understand all the learning styles for the three models of learning styles; subsequently to identify their characteristics. In Kolb’s model of LS, four types of learning styles were identified; namely (i) converging learning style (a combination of abstract and active), (ii) the diverging style (a combination of concrete and reflective), (iii) the assimilating style (a combination of abstract and reflective) and (iv) the accommodating style (a combination of concrete and active) (See Figure 1).

Honey and Mumford’s model of LS was produced in 1992 after spending four years experimenting with different approaches to assessing individual differences in learning preferences. This model’s link with Kolb’s work remains strong (Coffield et al., 2004) as it is connected to a revised version of Kolb’s experiential learning cycle. And perhaps due to this reason, Honey and Mumford’s model of LS have also identified four types of learning styles; namely (i) activists, (ii) reflectors, (iii) theorists and (iv) pragmatists (see Figure 1).
Felder and Solomon ILS was used to determine the learning styles that have been identified in the Felder and Silver model of LS. There are four axes to assess learners in the F&S-ILS; namely (i) whether a learner perceive information better visually or verbally, (ii) does a learner progress towards understanding globally or sequentially, (iii) whether a learner prefers sensory or intuitive types of information; (iv) does the learner prefer to process the information actively through engaging in physical activities or discussions or reflectively – through introspection (see Figure 1). In this scope of research, the axes that have been put into consideration are how the learners process and receive information.

![Diagram of learning styles](image)

**Fig 1: Kolb, Honey and Mumford, and Felder and Silverman Model of Learning Styles (Syed-Khuzzan & Goulding, 2008a)**

The learning styles from the three models of LS were identified and disaggregated in detail (can be seen in Syed-Khuzzan and Goulding, 2008b).

**Development Stage 2**

This development stage was used to identify the ‘similar’ characteristics of each learning styles in the three models by amalgamating them together, in order to tease out four core themes (identified as Learning Styles A, B, C, and D). Figure 2 shows which similar learning styles from the existing three core models of learning styles fall into the new core themes of learning styles; i.e. for learning style A, it is similar with learning style accommodator in Kolb model of learning styles, activist in Honey and Mumford model of learning styles, and active-sensing, from the Felder and Silverman model of learning styles.

The abstract conceptualisation of which shows the four core themes, learning style A, B, C, and D. Figure 2 shows which similar learning styles from the existing three core models of learning styles fall into the new core themes of learning styles; i.e. for learning style A, it is similar with learning style accommodator in Kolb model of learning styles, activist in Honey and Mumford model of learning styles, and active-sensing, from the Felder and Silverman model of learning styles.
Based on the amalgamated/synthesised model shown in Figure 2, the characteristics of each core theme were then identified. Each core theme was classified with a specific characteristic of learning styles (See Table 1 for the characteristics formed for the new proposed model of LS).

**Fig 2: Amalgamated/synthesised model-abstract conceptualisation (Syed-Khuzzan and Goulding, 2008a)**
Table 1: Learning Styles Characteristics formed for the New Proposed Model of LS (Syed-Khuzzan and Goulding, 2008a)

<table>
<thead>
<tr>
<th>LS Core Themes</th>
<th>Learning Styles Characteristics formed for New Proposed Model Of LS</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Likes to have a go on things spontaneously and try out</td>
</tr>
<tr>
<td></td>
<td>Likes direct independent actions (based on personal believes and feelings)</td>
</tr>
<tr>
<td></td>
<td>Likes to be in the centre of attention; but may learn better by themselves</td>
</tr>
<tr>
<td></td>
<td>Accepts failure as part of an experience in the learning process – look forward.</td>
</tr>
<tr>
<td></td>
<td>Outgoing and enthusiastic – likes to explore complexities, crisis and excitement</td>
</tr>
<tr>
<td></td>
<td>Bored by details (don’t like repetitions) – likes new opportunities and experiences</td>
</tr>
<tr>
<td>B</td>
<td>Likes to think in detail before taking any actions - prefer a thoughtful approach and thorough evaluation</td>
</tr>
<tr>
<td></td>
<td>Very patient with detail – very careful when it comes to work</td>
</tr>
<tr>
<td></td>
<td>Likes to listen and observe</td>
</tr>
<tr>
<td></td>
<td>A low profile person when learning in groups; prefer to work alone</td>
</tr>
<tr>
<td></td>
<td>Likes repetition in learning</td>
</tr>
<tr>
<td></td>
<td>Prefer to discuss specific issues as opposed to engaging in social discussions</td>
</tr>
<tr>
<td>C</td>
<td>Likes logical ideas, theories and concepts</td>
</tr>
<tr>
<td></td>
<td>Likes organised and structured understanding – prefers materials that are fundamentally understanding</td>
</tr>
<tr>
<td></td>
<td>Likes to see the overall picture first; then pay attention to the details (very patient with details)</td>
</tr>
<tr>
<td></td>
<td>Likes focused and structured situation with a clear purpose – can define problems and propose possible solutions</td>
</tr>
<tr>
<td></td>
<td>Prefer logical and thoughtful ideas – likes logical presentation of ideas</td>
</tr>
<tr>
<td></td>
<td>Tend to be a perfectionist – very careful and serious with details</td>
</tr>
<tr>
<td>D</td>
<td>Believe in getting straight to the point</td>
</tr>
<tr>
<td></td>
<td>Likes learning materials to be short and to the point</td>
</tr>
<tr>
<td></td>
<td>Will do whatever that is necessary to get something done.</td>
</tr>
<tr>
<td></td>
<td>Likes to see how things work in practice; relevancy with what has been learnt</td>
</tr>
<tr>
<td></td>
<td>Considered a realist – like activities to be real; likes proven techniques</td>
</tr>
<tr>
<td></td>
<td>When learning something new, likes to engage in the activities rather than</td>
</tr>
</tbody>
</table>

**Development Stage 3**

The final stage of this development process was used to formulate the questions within the four core themes. Six questions were formed for each core theme, adding up to a total of 24 questions. The process of forming the questions was considered critical as it needed to accurately crystallise the core ‘essence’ of each learning style.

**Discussions**

With the context of this research, this questionnaire went through two validation processes, (i) piloting with five domain experts, and (ii) testing with 90 respondents. The developed questionnaire was piloted with five domain experts. These experts were professors/ educators from the United States of America, United Kingdom, and Canada. They were chosen based on their experience in the learning process, and adult learning with years of experience emphasising in learning styles, and learning psychology. The experts were requested to provide feedbacks and views concerning:

- Questionnaire Content
- Questionnaire Validity
- Questionnaire Construct
- Questionnaire Format
- Type and level of questions used

From the pilot survey, several core issues were discussed and highlighted; which can be seen as follows:

**Method of forming the questionnaire**

The domain experts found that the method used in developing the questionnaires was a sound and reasonable approach.
Suitability of diagnostic questionnaire as a mechanism in teasing out learners’ preferred learning styles

Although there were some differences in opinion in the use of a diagnostic questionnaire as the best mechanism to tease out learners’ learning styles, the experts were quite contented with the use of a self-assessed instrument due to time and costs factors, and to the fact that, self-assessed learning styles tests have been used quite extensively these days.

Number of questions

The numbers of questions were considered reasonable, as long as the questions could tease out the core characteristics of each style. Additional questions would have caused time constraints to the respondents, as they were given certain time periods to complete the questionnaire in a controlled environment (allocation of time depended on which sample set they were categorised into).

Scoring mechanism

There was an issue that the scoring mechanism used would put learners into rather well identified traits (whilst it is known that many learners have more complex responses), and may also be associated with several trait sets, i.e. pushing them into a category of learning styles, instead of using a Likert scale type of response structure which enables more complex matching. In the context of this research, the diagnostic questionnaire will function as a learning style instrument that will ‘push’ a learner into one specific learning style category. Due to this, it was anticipated that the ‘Yes’ and ‘No’ mechanism would be the best possible way to approach this. In addition, learning styles in the context of this research have been based on the theory that each learner had a preferred individual learning style profile, and that learning styles are somewhat stable (albeit congruence of ‘shared’ norms have yet to be agreed in the literature).

Upon receiving feedback and comments from the domain experts, the diagnostic questionnaire was amended and refined accordingly. Subsequently, this questionnaire was then, administered to 90 respondents within a University located at the North West of the UK.

The second process of the validation of the diagnostic questionnaire was undertaken with 90 respondents within a University located at the North West of the UK. The diagnostic questionnaire was administered alongside with the original models in developing the questionnaire, i.e. Kolb-LSI, H&M-LSQ, and, FS-ILS.

Figure 3 depicts how the 90 respondents were divided into four sets, whereby each set represents different sets of combination instruments (questionnaires/ learning styles inventories) that were undertaken by the respondents. The respondents came from a diversity of different backgrounds targeted to address the following issues; (i) age, (ii) gender. (iii) educational background, (iv) ethnic group, and others to ensure that no bias occurred during the conduct of the testing. The sample sets, which was administered; i.e. completed by the respondents gave a 100% rate of return due to the nature of the data collection approach, whereby it was delivered by hand to respondents and collected later (delivery and collection questionnaire). These respondents were administered in a controlled environment whereby they were given reasonable time to complete the questionnaire. Upon completion, the questionnaires were personally collected from the respondents themselves.
Fig 3: Respondents' Sample Sets

Diagnostic Questionnaire +
Kob (LSI)
(20 Respondents)

Diagnostic Questionnaire +
Kob (LSI) +
H & M (LSQ) +
F & S (ILS)
(20 Respondents)

Diagnostic Questionnaire +
H & M (LSQ) +
F & S (ILS)
(20 Respondents)
Conclusion

This paper described the development of a Diagnostic Questionnaire as an inventory/instrument to diagnose a learner’s learning style preference which will then be mapped into a PLE prototype (as a strategy to accommodate a combination of different learning styles in an e-Learning environment). The amalgamations of the three existing models of LS identified four core themes of LS.

As a way forward, the findings from the data collected will be analysed statistically to determine the reliability, and validity of the diagnostic questionnaire. The limitations of this research has been emphasised under four main issues, (i) population sample, (ii) context of research, (iii) generalisation, and (iv) theorists of the defined models of learning styles defined in the literature. The first issue regarding the population sample lies in the juxtaposition of validating the diagnostic questionnaire, consisting of 90 respondents, balanced against the three domain experts when validating the PLE conceptual framework. The second and third issue highlighted in the context of this research is related. Since this research was focused towards the UK context, there will be an issue on the level of generalisation. Although the diversity of the respondents came from different background, targeted to address the issues of age, gender, educational background, culture background, etc in ensuring that no bias took place, generalisation would still be an issue of concern. The final issue lies upon the theorists of the existing models of learning styles defined in literature, that have been chosen as foundations on the development of the diagnostic questionnaire. Although several literature review have supported the reliability and validity of these models, there have also been critiques, and other weaknesses highlighted by other philosophers within the domain of learning styles. Due to this limitation, there is an issue of concern, regarding the verification of the diagnostic questionnaire as a learning style test/instrument.

Upon validation, this diagnostic questionnaire will then be ‘mapped’ into a PLE for further research and development work, including the augmentation to each of the four learning environments (A, B, C and D) identified at the outset of this paper.
References


Faculty Performance Evaluation in a Hybrid Program

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Abstract

Hybrid programs are increasingly assuming popularity due to the perceived synergy between the online and conventional face-to-face pedagogies. The genesis of the research problem addressed in this paper stems from the feedback of the students in a hybrid program about their relative dissatisfaction with the online faculty in comparison to the face-to-face faculty. The taxonomy proposed by Blignaut & Trollip (2003) was utilized by including two new dimensions namely, the discussion board (DB) topics and length of the faculty postings to measure the teaching presence in four completed classes of the hybrid program. Useful information about the modus-operandi and performance of the online professors was revealed in the analysis. The measurement tool was also found useful for continual evaluation of online faculty performance in the ongoing classes to aid them in maneuvering their DB contributions to improve student satisfaction.

Keywords: Hybrid program; Faculty performance; Evaluation

Introduction

The immense popularity of blended learning can be attributed to the fact that it derives synergy between the online and face-to-face pedagogies in the best possible way. Bersin (2004) defined blended learning (also called hybrid learning) as a combination of different training “media” (technologies, activities and types of events) to create an optimum training program for a specific audience. Blended learning has been hailed as the most efficient teaching model (Alonso et al, 2005) resulting in higher achievement levels (El-Deghaidy & Nouby, 2007) compared to purely online or purely traditional models of learning. However, some studies did not find any significant difference between the hybrid course and the traditional course in students’ achievement, knowledge retention, satisfaction, and attitude (Delialioglu & Yildirim, 2007). By virtue of being a relatively new pedagogy, online learning component of blended programs is often subjected to more intense scrutiny with respect to the learning experience on part of students. Garrison et al (2000) lay out a conceptual framework that identifies the elements that are crucial prerequisites for a successful higher educational experience. These elements are: cognitive presence, social presence, and teaching presence. The role of professors in the online component is much more diverse compared to that of the traditional face-to-face component. Online instructors should contribute advanced content knowledge and insights in addition to moderating the discussion (Shank, 2001), should possess high interpersonal skills (Derntl & Motschnig-Pitrik, 2005), should conduct closure for the discussion, should provide ‘answers’ for the questions and conclusions for the issues discussed as experts (Lim and Cheah, 2003) and should model the behaviour they expect from the students (Burd and Buchanan, 2004). Extensive faculty interaction with students in online classes results in higher retention rate (Bocchi et al,
2004), adds value to learner perception and satisfaction, and may also positively impact actual learning outcomes as measured by student grades (Restauri, 2006; Bedi & Lange, 2007).

There are some studies which undermine the importance of faculty-student interactions in the online component. A study by Ausburn (2004) revealed that participants in a blended program ranked communication between instructor and students in online chat or discussion forum seventh out of a possible eight, thus arguably rating it as a less important component of the blended environment. A study by Woods (2002) found that more frequent delivery of personalized email from the professor to the students did not increase the amount of student participation in required discussion formats.

“Power distance” is a term which signifies hierarchical difference as deemed legitimate by the members of a group or society (Hofstede, 2001), who feel that there are an elite few (higher up in the hierarchy) with more knowledge, skill and decision making ability (Sagie & Koslowsky, 2000). In a study, it was concluded that in a hybrid learning environment, students with high power distance would prefer to seek feedback from fellow students rather than from the professor (Hwang & Francesco, 2006). However, the study could not establish any significant positive relationship between power distance and participation on the electronic discussion board.

**Research Objectives**

In December 2006, Singapore-headquartered online institution Universitas 21 Global (U21Global) joined hands with N S Raghavan Center for Entrepreneurial Learning (NSRCEL) at the Indian Institute of Management Bangalore (IIMB) to create a blended program for entrepreneurs and family businesses. The one-year program is called Management Program for Entrepreneurs and Family Businesses (MPEFB). In addition to regular evaluations of courses, ongoing evaluations for improving instruction and student learning in blended programs have been recommended (Levin et al, 2002; Amrein-Beardsley, 2007; Akkoyunlu & Yılmaz-Soylu, 2008). Therefore, during the first offering of the program (Batch 1), a survey instrument was executed during the Term 2 to gauge the learning experiences of the students. The quantitative data and the subjective comments of the students revealed minimal contributions on the online discussion boards from the IIMB faculty, who were given the responsibility of facilitating the face-to-face as well as the online component of the program. The directors of the program realized that the IIMB faculty neither had the inkling nor the time to actively participate in online discussion. A similar scenario has been reported by Chong (2006). As a result, for the second offering of the program (Batch 2), it was decided that the U21Global faculty would facilitate the online component, while the IIMB faculty would conduct the face-to-face sessions for the program at the IIMB campus. It was expected that both the institutions would be able to thus bring their expertise in the program. Some other modifications were also brought about in the program as per the feedback of students received through the survey (Bedi, 2008). The same survey instrument was executed again for Batch 2 (started in January, 08) students in Term 2. Astonishingly, the feedback received from the students about the U21Global faculty in the online component was not very encouraging, especially compared to the IIMB faculty, who conducted the face-to-face sessions (Figure 1).
The students elaborated about choosing the “Not helpful at all”, “Not helpful” or “Neutral” options for the U21Global faculty in the survey in their subjective comments such as: “(Online) discussions moderation is very poor”; “Quality of (online) discussions is poor”; “It will be more effective if the ‘Face-to-face sessions’ faculty also interacts (with students on the DB)”; “Asynchronous mode of discussions made it difficult to have long discussions”; “Reduce the quantity of discussions (topics) and increase the quality, so that there is more value-add.” Further informal feedback with students revealed that they tended to compare the “value-add” by the U21Global online faculty with that of IIMB faculty in their face-to-face sessions. Thus, this inadvertent “competition” between “online” and “face-to-face” faculty may be very typical of this unique blended program. These findings led to the formulation of the research objectives as under:

- To gauge the extent of “teaching presence” of the faculty on the online discussion boards (DBs).
- To identify any trends in the level of student participation on the DBs.
- To determine any relationships between the level of faculty participation and the corresponding level of student participation on the DBs.
- To analyse if the length of faculty postings has impact upon student engagement on the DBs.
- To recommend a simple yet pragmatic self-control tool to aid the faculty in providing a better learning experience to the students on the online DBs.

**Method**

Bright (2007) reported about a work-in-progress project, which seeks to capture the impact on practice inherent in the collegial development of a theoretically informed framework which enables lecturers to monitor and analyse what they do to create an effective online teacher presence and thereby facilitate a productive online learning environment for their students. The present study utilizes the taxonomy proposed by Blignaut & Trollip (2003) to categories the faculty postings (with academic content) into three categories namely, Corrective, Informative and Socratic. This taxonomy was preferred compared to that of Anderson et al (2001), as it recommends each faculty posting to fall in any one of the proposed categories and the categories are more helpful in clearly guiding the actions of the faculty to
manoeuvre their interactions with the students on the DB for different results. For example, a “Socratic” posting by faculty would pose some questions to the students and hence, encourage more participation. On the contrary, a “Corrective” posting by faculty may help in curbing a DB thread moving into an unnecessary dimension. “Informative” postings from faculty would be useful in providing new insights and in arousing the interest on part of students. Thus, such postings would also encourage more active participation from the students. In this paper, it is proposed that unless the measurement of “teaching presence” is done on a per DB topic basis in an online class, it would not be useful to guide the actions of the professors facilitating the same. This is in contrast to the study by Blignaut & Trollip (2003), who tried to arrive at faculty participation benchmarks by analysing the cumulative faculty postings for all the DB topics in a class and comparing the same with other classes. Secondly, in this paper, a new dimension about the “length of faculty posting” is introduced in order to gauge the “substance” (or “meat”) in various types of faculty postings. The three categories utilized in this regard are – “1-2 liners”, “3-5 liners” and “6-10 liners”. However, no attempt has been made to gauge the quality of academic content in the faculty postings in this study. The study considers faculty postings only with academic content and neglects all other types of postings by faculty on the DBs. It also does not consider other forms of faculty-student interactions like email, online chat and announcements.

Four completed sections of MPEFB Batch 2 belonging to Term 1 and Term 2 (there are four terms in total) were considered in this study. There were 52 students in Term 1 and 48 students in Term 2 (four students had withdrawn on health grounds/ personal reasons after Term 1 and were granted permission to rejoin during the Term 2 of the next batch of MPEFB). Tables 1 to 4 show the data pertaining to these four sections (Courses A, B, C and D) with appropriate graphs to aid in analysis. All the four sections are different subjects facilitated by four different professors. The colour coding of the various columns in the tables 1 to 4 represents the same colours as used in the corresponding bar graphs/ line charts.

**Analysis & Findings**

The data and graphs in tables 1 to 4 reveal some interesting findings:

1. The total student postings show a decreasing trend from the first to the last DB topic in all the four courses. However, apart from Course C, a steep jump in the number of student postings at the resumption of online classes after the mid-term face-to-face sessions is observed in all the other three courses.

2. The number of students who participated on the DB invariably decreased from the first to the last DB topic in all the four courses.

3. Apart from Course A, the total number of faculty postings show a decreasing trend from first to the last DB topic in all the other courses.

4. “1-2 Liners” postings constitute a majority of faculty postings in all the four courses.

5. “Informative” postings constitute a majority of faculty postings in all the four courses.

6. “1-2 Liners” constitute a large majority of “Informative” and “Socratic” faculty postings in all the four courses.

7. Apart from Course C, the numbers of “Corrective” faculty postings were minimal compared to “Informative” and “Socratic”.

8. Course A shows the lowest number of total postings made by the faculty
(only 41), out of which a majority (33) of postings were “1-2 Liners”.

9. In all the four courses, there were no “6-10 Liners” Socratic postings from the faculty.

10. 40 is the highest number of students who participated on a DB in Term 1 courses (A & B), out of the total number of students (52). 37 is the highest number of students who participated on a DB in Term 2 courses (C & D), out of the total number of students (48).

11. In none of the four courses, faculty made a posting of more than 10 sentences.

12. In all the courses, the number of student postings curve closely follows the number of total faculty postings curve. Thus, the strong positive correlation between the two is clearly evident.

The above findings helped in analysing the various implications of the “teaching presence” and in fulfilling the research objectives outlined earlier:

1. The “teaching presence” of the faculty has been dominated by “1-2 Liners” and “Informative” faculty postings. This is a clear indication that the value-add by the faculty in improving the understanding of the students has indeed been low. As is obvious, the “professorial” inputs possible through “6-10 Liners” were very few to highlight the value of faculty presence in the online component of the program. This impacted further when the students compared the contributions of the U21Global online professors with their IIMB counterparts who conducted the face-to-face sessions.

2. Student participation measured by the number of student postings and the number of students participated has shown clear declining trends from the first to the last DB in all the four subjects. However, an upsurge in student participation was always observed on the DB immediately after the mid-term face-to-face sessions.

3. There is a strong positive correlation between the level of faculty participation and the corresponding level of student participation on the DBs.

4. The length of faculty postings indeed has a bearing upon student engagement on the DBs. The high number of “1-2 Liners” and sparingly used “6-10 Liners” resulted in declining student posting numbers and the number of students participated.

5. The simple tables and graphs used in the study would aid the faculty in providing a better learning experience to the students on the online DBs. In the study, the tables and graphs have been used to analyse the “teaching presence” after the online classes were already over. The main utility of these tables and graphs would be in monitoring the “teaching presence” during the classes in progress. These tools can be used for self-control of “teaching presence” by the faculty themselves or by the program administrators. For example, if decline in student participation is noticed in the second DB topic, the faculty may like to increase the “teaching presence” by way of more comprehensive postings of different types to keep the students engaged and interested.

This is the first time that such a comprehensive examination of “teaching presence” has been conducted at U21Global. Normally, faculty’s performance in purely
online MBA classes at U21Global is gauged by student satisfaction survey (called Student Evaluation of Faculty - SEF) and the report of the Subject Area Coordinator. All the four professors used in the four sections considered in the study have always scored highly on the SEF in the purely online classes and some of them are rated as “Star Professors”.

Table 1: Faculty participation in Course A – Term 1 (Total no. of students = 52)

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<th>Postad Glu.</th>
<th>Student</th>
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Graph: Type of Faculty Postings

Graph: Length of Faculty Postings
Table 2: Faculty participation in Course B – Term 1 (Total no. of students = 52)

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Graph: Type of faculty postings

Graph: Length of faculty postings
Table 3: Faculty participation in Course C – Term 2 (Total no. of students = 48)

<table>
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<th></th>
<th>Corres.</th>
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<th>Students</th>
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</table>

Graph: Type of Faculty Postings

Graph: Length of Faculty Postings

(487)
The students of MPEFB comprise a very unique cohort of entrepreneurs and members of family businesses. The main objective of these “owner-managers” in undergoing such a program is to “acquire knowledge” and “improve managerial skills” to better manage their enterprises. This is in contrast to the students in the MBA or other degree awarding programs and also the participants in the corporate executive education (EE) programs. The levels of student participation in the degree awarding and EE programs is usually very high due to the motivation to acquire the degree or due to pressure from the company HR to perform well in the EE programs. However, in MPEFB, the student motivation is primarily guided by the utility of the concepts covered and professor’s inputs in directly improving their businesses. Thus, the faculty’s performance in the online component is gauged by the students on different parameters compared to the degree awarding and EE programs. The online faculty training program (FTP) at U21Global does provide inputs to the faculty about maintaining the faculty presence and to motivate the inactive students to participate in the discussions. However, it does not provide explicit inputs about the types and length of faculty postings and their possible use in keeping the unique cohort of MPEFB students engaged and interested. Thus, in the subsequent terms of the current batch and the future offerings of the program, the program director would conduct one-to-one meetings with the faculty to apprise them of the utility of the tools used in the study in controlling student participation and engagement in a better way.

Table 4: Faculty participation in Course D – Term 2 (Total no. of students = 48)

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<th>Supportive</th>
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<th>Students Participated</th>
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Conclusion

In earlier studies, the ways of measurement of “teaching presence” in online classes have been proposed. In this study, the unique issues related to the “teaching presence” in the online component of a blended program have been highlighted. The purpose of the asynchronous discussions in this program was to provide an opportunity to this class of entrepreneurs and members of family businesses to share experiences on various facets of their entrepreneurial ventures with each other under the guidance of an online faculty. The issues have been aggravated by the direct comparison of the students between the academic contributions of the faculty facilitating the online component with their counterparts conducting the face-to-face sessions in the same courses. The study utilized the taxonomy proposed by Blignaut & Trollip (2003), however the data of faculty postings was further segregated on two new dimensions namely the DB topics and the length of faculty postings. Recently concluded four courses in the blended program were considered. Analysis of the tables and graphs revealed that the “teaching presence” of faculty was dominated by “1-2 Liners” and “Informative” postings while “6-10 Liners” and “Corrective postings” were rarely present. The declining “teaching presence” from the first to the last DB had directly impacted the student presence measured by the number of student postings and the number of students participated on the discussion board in all the four courses. The method employed in the study to measure “teaching presence” has been found simple yet effective for the completed classes. It is anticipated that the method will be much more useful in continually tracking the teaching presence in ongoing classes on a per DB topic basis either by the faculty themselves or by the administrators of the programs in order to make mid-course corrections to improve student engagement on the online DBs. The study also highlighted the need to refurbish the faculty training program to inform the faculty about the benefits of the continual measurement of their own “teaching presence” and accordingly manoeuvring their postings to improve student engagement on the online DBs. The limitation of this study is the consideration of only four courses pertaining to four different subjects in a blended program. The method used here would have allowed direct comparison between the “teaching presence” of the professors had the courses pertained to the same subject. Perhaps, in such a scenario, it would have been possible to also gauge the quality of academic content in faculty postings, which was not possible to do in this study.
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Reusable Objects: Learning Object Creation Cycle

Mutlag Alsubaie
Mustafa Alshawi
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Abstract
The principle of Reusable Learning Objects (RLO) is to break education material into smaller chunks of material that can be readily digested and more easily learnt by the learner. Hence, creating and developing courses based on RLO(s) gives learners the option to select courses that are based on the learners personalised needs, optimised to cognitive needs and financially viable as well as creating courses that are pedagogically based and give the ability to overcome traditional barriers to learning. The key problems faced by relevant stakeholders is the fact that there are very few guidelines available that can feasibly take pedagogic material and create the respective RLO(s). This paper attempts to introduce a key framework (life cycle) that can realistically and feasibly realise the creation of Reusable Learning Objects.

Keywords: Learning Objects, Reusable Learning Objects, Object Life Cycle

Introduction
Driven by the current technological driven digital information age and its key facilitator, the Internet, education has become a field which is being inexorably digitally transformed (Wiley, 2000). By harnessing the power of these technologies and combining them with the way people learn offers today’s learners unprecedented and unparalleled access to potentially thousands of courses worldwide (Benosova et al, 2001) (Pilkington et al, 2000). One of the current methods that is generating interest is in the area of Reusable Learning Objects (Wiley, 2000).

The idea that is at the heart of RLO(s) is to break education material into smaller chunks of material that can be readily digested and more easily learnt by the learner. Further creating and developing courses based on RLO(s) gives learners the option to select courses that are based on the learners personalised needs, optimised to cognitive needs and financially viable as well as creating courses that are pedagogically based and give the ability to overcome traditional barriers to learning (Clark, 1998). This quality gives the user the flexibility to choose their courses based on their perceived abilities.

Although the ideals and utilisation of the RLO has been well documented, the key problems faced by relevant stakeholders is the fact that there are very few guidelines available that can feasibly take pedagogic material and create the respective RLO(s) (Al-Subaei, 2005). Further, there are fewer organisations that can take any pedagogic material and create RLO(s). Those organisations that do, e.g. Cisco, tend to be mired in technical intricacies and are subject to change (Al-Subaei, 2005).

To address the aforementioned problem, this paper attempts to introduce a key framework (life cycle) that can realistically and feasibly realise the creation of Reusable Learning Objects. The life cycle that is presented can be shown to take most type of pedagogical material and produce Reusable Learning
Objects that are consistent with current industry standards. Thus it is anticipated that by using such a life cycle educators, trainers, teachers and respective stakeholders can readily create Reusable Learning Objects from any type of pedagogical based materials. This paper presents the Learning Object Creation Cycle (LOCC) and explains its key components, including the key output of the LOCC - the Reusable Learning Objects themselves.

**Reusable Learning Objects**

The RLO is defined as a digital entity that must include an independent segment of knowledge that is reusable, meta-tagged, aggregated, self contained, interoperable and which must encompass a single Learning Outcome [Al-Subaie, 2005],(Wiley, 2000), (WORC, 2002), (Longmire, 2000), (Singh, 2001), (Knolmayer, 2003).

One of the prime facilitators for the success of electronic learning has necessitated the key change in the way in which educational materials are designed, developed and delivered to those who wish to learn. The idea behind one such element - the RLO - is to sequence or organise such RLO in such a way that the learning experience is enhanced by utilising the benefits of technological approaches linked with traditional pedagogical approaches.

It is to this end that Reusable Learning Objects were chosen as a vehicle to become the next generation of instructional design, development and delivery due to their potential for reusability, generativity, adaptability and scalability (Longmire, 2000), (Hodgins, 2000). The power that RLO leverage in terms of offering robust, powerful, viable and reusable alternative to traditional course material was inevitably a good tool to employ in the development reusable, sustainable, robust, flexible Instructional Systems such as those found in Learning Content Management Systems (LCMS) and Content Management Systems (CMS) (Singh, 2000), (Longmire, 2000), (Ellis, 2001).

Essentially, Learning objects are elements of a new type of computer-based instruction based on the object-oriented paradigm of computer science. Object-orientation highly values the creation of components that can be reused in multiple contexts (Dahl and Nygaard, 1966). This is the fundamental idea behind learning objects: that instructional designers can build small - relative to the size of an entire course - instructional components that can be reused in different learning contexts. In addition, learning objects are generally understood to be digital entities that can be deliverable over the Internet. This means that any number of people can access and use them simultaneously (as opposed to traditional instructional media, such as an overhead projector slides or video tapes, which can only be used in one place at only one specific time).

Moreover, those who integrate learning objects can benefit from newer versions of courses immediately (Wiley, 2000). There are significant differences between learning objects and other more traditional instructional media that have existed previously. Such differences include:

- **media exchangeability** – traditional material have been notoriously difficult to convert into different mediums without significant cost and time elements. However, by employing essentially an electronic format Learning Objects can readily, rapidly and efficiently transform from medium to medium. For example, RLO(s) can easily be transferred to other electronic platforms as well as from media to media (i.e. a printout hardcopy can easily be sought by simply printing out the RLO in electronic format etc).

- **flexibility** – RLO(s) can give added flexibility by allowing stakeholders to select the format as well as deciding on the precise nature of RLO given. Thus any additional changes can be made seamlessly and on the fly whilst
simultaneously offering excellent value for money. On the other hand, stakeholders do not have a constructive say as to what is inputted in traditional material. This makes traditional learning material inflexible since it does not cater for the needs of the **stakeholder** – rather they take care of generic stakeholders which allows critical mistakes to develop in creating the traditional material cost - there are significant costs associated with traditional learning material. Costs such as those associated with publishing large amounts of material and reprinting such materials have a large effect on the budget of many learning stakeholders. However, by employing RLO(s) stakeholders can reduce costs associated with publishing since the RLO(s) are effectively within an electronic format.

**maintenance** – high cost and high maintenance have been the mainstay of traditional printing material. However, by utilising an electronic RLO approach stakeholders can effectively and efficiently maintain their electronic based material at a fraction of the cost it takes to maintain traditional material as well as to effect such maintenance within a designated timespan.

Further, supporting the notion of small, reusable segments of instructional media, (Reigeluth and Nelson, 1997) suggest that when instructors first gain access to instructional materials, they often break the materials down into their constituent parts. They then reassemble these parts in means that support their individual instructional goals. This suggests one reason as to why reusable instructional components, or learning objects, may provide instructional benefits – if instructors received instructional resources as individual components, this initial step of decomposition could be bypassed, potentially increasing the speed and efficiency of instructional development and deployment of courses.

**Proposed Framework**

The key purpose of developing the Learning Object Construction Cycle (LOCC) framework is to create RLO(s) from pedagogical based material. Essentially, the Instructor need only to take the selected pedagogical material for a given course and follow the five steps stipulated in the LOCC. Upon completing the LOCC, the Instructor should find that they have fully developed RLO(s) which are based on Industry standards and are pedagogical in nature.

The basis of breaking up the material within the LOCC is essentially based upon Instructional Objectives and Learning Outcomes. In the first instance, Instructional Objectives are utilised to define the objectives of what the learner is supposed and intended to learn once they perform the course. Naturally such objectives are given primarily at the start of the course to potential participants of the course. On the other hand, Learning Outcomes are what the learner or participant will learn upon completion of the pedagogical based material.

Thus, after collating all the relevant selected traditional pedagogical based material a suitable course syllabus should be utilised to develop the material. The syllabus is developed based on Instructional Objectives. The Objectives are used in the first instance to break down the selected material to eventually create RLO(s) as depicted in Figure 1. The last step of the LOCC framework that creates an RLO, asks whether or not the decomposed material encompasses a Learning Outcome. The culmination of the LOCC framework should result in robust, portable pedagogic based RLO(s) that each fulfils the RLO criterion as described in the previous section. The LOCC framework is detailed in the subsequent key steps.

**Implementation Steps**

The LOCC framework principally consists of a five step framework. The goal is to produce pedagogical based RLO(s) that can be utilised
within Instructional Systems. The framework takes selected traditional based material and is filtered through a five step life cycle and is a proven facilitator in the creation of RLO(s). The five implementation steps are stipulated as follows:

**Step 1**

The first step of the LOCC necessitates the use of pre-planned key Instructional Objectives to select and organise the selected traditional pedagogic material into distinct groups. Thereafter, planned Instructional Objectives are utilised to pre check that the specific material covers the syllabus for each group. This is to assess whether the specific material for each group complies with the Module specifications in accordance with standard guidelines (Cisco, 2003). If the material does not fulfill the criteria for a module, the learning material is recycled back to the top of the LOCC (knowledge content). The rejected material may be integrated with other traditional material to form new pedagogic material that can be tested to see if it can be used for another module.

However, if the group material satisfies the Module specifications and the associated Key Instructional Objective, the pedagogic material is accepted to be utilised as material capable for a module and progress to Step 2.
Step2
The successful material content from the first step for each module is divided to see if the material can encompass the planned Instructional Objectives that are associated with the Key Instructional Objectives. The material content is tested to establish whether or not the material can represent the Instructional Objectives which can be feasibly sequenced within a pedagogical order. The next test is to see if the pedagogically based sequenced material content can be created into feasible lessons in accordance with standard guidelines (Cisco, 2003).
If there is not enough learning material to construct a lesson, the learning material is recycled back to the original knowledge content for possible future use by integrating it with other material to see if it can fulfill Instructional Objectives and satisfy part of the syllabus. If it cannot fulfill this requirement

Fig 1: Proposed RLO’s Life Cycle
the material is discarded from the LOCC. However, if the material to create a lesson is feasible, then the material can progress to step 3.

**Step 3**
The pedagogic based content of each lesson established by Step 2 is examined to identify any self contained pedagogic based material segments. If there are no self contained material segments that can be identified then the material is recycled by sending it back to the beginning of the previous step. Once such segments are identified they are then tested to establish whether the pedagogic based material segment contains a single distinct learning outcome. On the one hand, if there are any segments of pedagogic based material that do not satisfy a distinct learning outcome, the material is recycled by sending the material to be integrated and reprocessed with material at the Module level (the beginning of step 2). This is to see if the recycled material can be formed into new lessons by integrating the material with other extraneous recycled material. If the material still cannot be utilised it is rescinded completely by exiting the LOCC. On the other hand, if there are segments of pedagogic based material that can each satisfy a distinct learning outcome, then the material is sent to step 4.

**Step 4**
The suitability of each segment of learning material that possesses a distinct learning outcome is mapped against the RLO characteristic criteria (see section 1.2) to see if it qualifies to become a RLO. If the segment of learning material fails to be mapped against the RLO criterion, the material is recycled by sending the material to be integrated and reprocessed with material at the Lesson level or the beginning of step 3. This to see if the recycled material can form potential RLO(s). If the material cannot be utilised to create potential RLO(s) they are sent to be recycled at the beginning of the Module Level. If the material still cannot be utilised it is then sent to be recycled at the beginning of the LOCC framework. This completes the LOCC framework. However if the material segment with an associated Learning Outcome satisfies the RLO criterion, the learning material is classed as RLO material.

**Step 5**
The final step required to successfully create the RLO, necessitates the pedagogic based material that has passed the RLO criterion. The ultimate result of this step creates the required number of pedagogically based RLO(s) that can be utilised within various course structures, are platform independent and that can be utilised within different Instructional Systems.

**Implementation**
A sample implementation is given to show how pedagogical based RLO(s) can be derived from the LOCC. The subject domain that was chosen is that of Workflow and the course was aimed at the undergraduate level. A pre-planned syllabus was created and it consisted of three modules. The first of which was entitled Introducing Workflow. This was therefore the Key Instructional Objective. The first module also included five planned Instructional Objectives as shown in Figure 2. Pedagogical material was collated and selected by the Instructor that would reflect the Instructional Objectives and was then administered in accordance with the steps of the LOCC as shown the previous section. Upon completion of the LOCC three RLO(s) were produced. The RLO(s) covered three of the initial planned Instructional Objectives, as shown in Figure 3.
### Key Instructional Objectives

<table>
<thead>
<tr>
<th>Introduce the Workflow by:</th>
<th>Introduce Workflow Models by:</th>
<th>Introduce Temporal Workflow by:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Defining the term Workflow</strong></td>
<td>Overview of the WF Model technique</td>
<td>Understand the notion of time management in workflow</td>
</tr>
<tr>
<td><strong>Explaining why workflow is required</strong></td>
<td>Introduce and explain the WF Model</td>
<td>Explain the time parameters that are associated with temporal workflow such as :Modeling, Absolute and Relative Time</td>
</tr>
<tr>
<td><strong>Explaining the benefits of WF</strong></td>
<td>Introduce the role of Workflow Modeling objects</td>
<td>Introduce and explain: Temporal-constraints and Consistency</td>
</tr>
<tr>
<td><strong>Introducing the key generic characteristics of the Workflow paradigm</strong></td>
<td>Define and explain the role of the Task within WF</td>
<td>Introduce the Temporal modeling technique</td>
</tr>
<tr>
<td><strong>Applying these characteristics to a basic application</strong></td>
<td>Explain the pertinent Task characteristics, such as: basic, Generic and Specific</td>
<td>Duration of a Sequential Structure, Alternative, Exclusive, Concurrent synchronised structures</td>
</tr>
<tr>
<td></td>
<td>Examine Basic Workflow Constructs such as: Sequence, Concurrency, Synchronization, Alternative, Simple Merge</td>
<td>Examine the duration of an Instance Type and the duration of the shortest /longest instance types</td>
</tr>
<tr>
<td></td>
<td>Understand the workflow verification process</td>
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*Fig 2: The first five planned Instructional Objectives*

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</table>

*Fig 3: The three of the initial planned Instructional Objectives*
**Conclusion**

This short paper has shown a practical framework that can create RLO from traditional pedagogical based materials. This framework has utilised a unique combination of Instructional Objectives and Learning Outcomes to break the selected traditional materials into potential RLO(s). In the first instance, the chief reasons why the Instructional Objectives were utilised is so that the material can be organised with a pedagogical order. On the other hand, Learning Outcomes were utilised to capture the result that is to be expected upon completion of a learning a specific RLO.
References


Oman’s Online Teacher Training Project: A Case Study

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Abstract

In order to prepare its young population for the future, Oman undertook efforts to provide continuing professional development opportunities for its teachers. This included the modernization of training methods, content, and mode of delivery through the Oman Online Teacher Training (OOTT) project. OOTT involved a 17-month pilot project of the design, development, implementation and evaluation of e-learning to train grade-11 teachers of math, science, and English.

The Oman Online Teacher Training (OOTT) project was funded by the U.S. Department of State’s Middle East Partnership Initiative (MEPI) in partnership with the Omani Ministry of Education (MOE). OOTT was managed by Creative Associates International Incorporated and implemented by Seward Incorporated International, based in Minneapolis, Minnesota. This presentation describes the work completed through the partnership. It describes the project goals and deliverables, the actions partners took to achieve the desired outcomes, the challenges partners faced, and the project outcomes attained.

Introduction

The Sultanate of Oman (Oman) is a Middle Eastern country eager to prepare its students to compete more effectively in global higher education and commerce markets. Oman’s population is approximately 2.3 million, 550,000 of whom are expatriates (many are temporary workers). Almost half of the population is under 18 years of age (Ministry of National Economy 2003; p. 3).

To prepare its young population for the future, Oman has undertaken efforts to provide continuing professional development opportunities for its teachers and to modernize both training methods and content. One such effort, the Oman Online Teacher Training (OOTT) project involved a limited pilot test of the development and implementation of e-learning.

Oman is not the first country to explore the use of technology for teacher training. Many countries have successfully used technology for both pre-service and in-service teacher training. The lessons learned from these earlier efforts have informed the approach taken in the OOTT project.

For example, nearly a decade ago, CD-based training was used to prepare in-service teachers to use the Pacific Algebra Network materials in their classrooms (PREL 2001). The poor connectivity and remoteness of many schools made the portable, self-contained medium an ideal in-service teacher training tool. The approach taken in these materials was to integrate instruction on pedagogy with videos of classroom practices.
The use of video modeling of teaching behaviors was also used in Malawi, Africa. Malawi, faced with the demand to quickly train large numbers of teachers, used interactive DVD training in its pre-service training programs (American Institutes for Research 2008). These DVDs provided pre-service training for grade 1-8 teachers on classroom practices and curriculum in life skills, science, math, and English. The menu-driven discs provided access to videos of teacher best practices, interviews with the teachers in the lessons, and vignettes in which teachers are shown how to create instructional materials from locally available resources.

A logical extension of the work described above is to use online courses for teacher training in developed countries, which have a schools equipped with computers and internet connectivity. Universities in Australia, Asia, Europe, and North America all have online degree programs in education. In Turkey, Biyik (2007) reports that interactive distance education has been used to address the shortage of trained English teachers. China and Korea are among the countries that have experimented with online courses to provide in-service teacher training (Jung 2001; Duan 2008). In each case, technical challenges and issues related to providing support to learners were reported and suggestions for addressing these challenges have been offered.

The effective design, development, and delivery of online teacher training also require specialized skills. Not all faculties are prepared to make the transition from classroom instructor to online instructor (Sales 2004 and 2009). While subject matter expertise may be sufficient in face-to-face courses, it is not enough to make an online course successful. Understanding, acknowledging, and building on learners’ knowledge and experience levels are essential (Gold 2001). Keeping online learners engaged through regular and structure activities is also key (Salmon 2002). And in synchronous online courses, managing online instruction can present overwhelming challenges to unprepared teachers (Briano, Midoro & Trentin 1997, Salmon 2004).

Based on the foundation of earlier research and practice, Oman decided to conduct its own investigation into the efficacy of online teacher training. The OOTT project was funded by the U.S. Department of State’s Middle East http://mepi.state.gov/outreach/index.htm Partnership Initiative (MEPI) in partnership with the Omani Ministry of Education (MOE). The project was implemented over a 17-month period, between February 20, 2006 and July 31, 2007.

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OOTT was administered by Creative Associates International Incorporated and implemented by Seward Incorporated International (Seward) based in Minneapolis, Minnesota (http://international.sewardinc.com/). Seward specializes in online learning design, development, implementation, and evaluation. Its international division has successfully undertaken educational technology projects in Asia, the Pacific, sub-Saharan Africa, and the Middle East.

The Seward project team, consisting of more than twenty individuals, worked with 12 teacher training and media production personnel from the Oman MOE. Together, this blended team designed and implemented all aspects of the project. While they worked
together, knowledge transfer activities took place to ensure the MOE would have the skills necessary to continue with the development of online learning.

This article describes the work completed through the partnership between the Oman MOE project staff and the Seward team. It describes the project goals and deliverables, actions partners took to achieve the desired outcomes, challenges partners faced, project outcomes attained, and lessons learned.

**Project Goals and Deliverables**

**Goals**
MEPI and the MOE agreed upon the following major outcomes for the OOTT project. Each outcome was important in assisting the Omani MOE in determining the viability of online teacher training and to provide the MOE with the skills and capabilities to implement further training, if desired.

1. Enable the Oman MOE to pilot online teacher training with secondary school teachers. Materials developed in the MOE’s high priority content areas of secondary math, science, and English would be built around active and student-centered learning methodologies. Through this effort the MOE would learn if teachers could and would engage in online training, and if it could be effective in changing teachers’ pedagogy and students’ learning outcomes.

2. Provide a means for building capacity within the MOE for the design, development, and implementation of online learning courses. As part of the MOE’s contribution to the project, they would provide staff to participate in the design and development of the online training. These staff would bring subject matter expertise and cultural knowledge to the project. As a result of their participation, they would develop knowledge of online learning techniques, instructional design, project management, and course implementation.

3. Provide a tool (i.e., software) with which the MOE could implement future online training for secondary school teachers in Oman. By participating in the project, MOE staff would be able to influence the selection or development of the tool and they would gain experience working with the tool to produce and implement future online training courses.

**Deliverables**
In addition to the above outcomes, the project design specified a set of deliverables or final products, which included the following:

1. A conceptual framework for the design and implementation of the Internet-based in-service teacher training;
2. Video footage that would be used to feature active teaching and learning approaches in the media-rich, internet–based teacher training modules;
3. Pedagogically sound, subject-specific teacher training and classroom implementation materials for three internet-based modules that would utilize the latest research-based teaching and learning strategies;
4. Training programs designed to build the skills and capabilities of the Master Trainers (i.e., the MOE project staff);
5. The implementation of an in-service teacher training program in three pilot schools with 15 teachers (five from each of three subject areas);
6. A report on the delivery and implementation of the teacher training in the pilot schools and on the
development of the internet-based teacher training modules;
7. Regular monitoring and evaluation reports that described consultations with the Omani MOE, including challenges and proposed solutions.

**Tasks Completed**

Working collaboratively, the Seward/MOE team achieved the deliverables described above by completing the following thirteen tasks:

1. Conducting a needs assessment and front-end analysis, this resulted in a conceptual framework for the project tasks.
2. Conducting the project setup based on the conceptual framework by working with specialized consultants, establishing time tables, and securing resources.
3. Producing a video shot lists, prepared props, arranged with schools, students, and teachers to participate in video production. Contracted with an Oman-based video production firm for equipment and personnel. Directed the production of video, digitized the video, and edited the video into vignettes for use in the online lessons.
4. Developing 13 brief (10-20 minute long) tutorials on active learning and competency-based assessment. Incorporating the video vignettes into these tutorials and making the tutorials available online in support of the teacher training modules.
5. Working to produce three teacher training modules using the best of modern pedagogy. Teachers, administrators, MOE officials, and other key stakeholders were included throughout the process to ensure accuracy, usability, and acceptance.
6. Training MOE team members on the use of online teacher training materials, providing them with technical assistance on how to work with teachers participating in the online training, and demonstrating the use the classroom training materials.
7. Selecting teachers from three Muscat secondary schools to be trained online and to use the classroom materials.
8. Evaluating the online training and classroom implementation in each of 15 pilot classrooms.
9. Monitoring the development of three additional course designs and content by MOE team members.
10. Building the capacity of MOE team members on the use of the administrative features of a learning content management system (LCMS) developed by Seward specifically for this project. This included have MOE team members input the content for three the additional courses they had designed. The LCMS is an advanced I.T. based system which can be utilized for other educational programs such as Child Centered Methodology approach.
11. Providing a formal course on instructional design for the MOE team members to further build capacity for the development of online learning modules.
12. Working closely with key Omani stakeholders throughout the project to ensure that knowledge transfer and capacity building occurred.

Presenting an end-of-project report to MOE and U.S. Embassy officials.

A timeline summary of the key events is provided in Appendix A.

**Project Management**

To facilitate project management, Seward approached the OOTT project as a collection of smaller individual projects, including:
- Design and development of active learning courses for online delivery;
- Capacity building in the area on online learning within the Oman MOE;
- Piloting and evaluation of online teacher training within three Oman schools; and
- Development of a LCMS that would enable the Oman MOE to produce online teacher training in the future.

A description of the process undertaken for each sub-project follows.

**Online Course Development**

A key factor in the design of all online courses, at the request of the Oman MOE, was that they incorporate active or student-centered learning. Since many active learning methods are applicable in a range of subject/content areas, it was determined that these methods would be presented in brief tutorials first, and then integrated into larger modules that modeled their use in specific subject areas.

A second important request was that the courses be media-rich including video. To achieve this outcome, it was determined that video, and to a lesser extent photographs, would be produced to model the use of active learning in the classroom. Working with a local video production company, The blended team (Seward/MOE) directed the production of 55 video clips that were incorporated into both the online tutorials and instructional modules.

Course design and development was a collaborative process between the MOE team and the Seward project team. Standard instructional design process and procedures, front-end analysis, macro designs, detailed designs, production, formative evaluation, and quality assurance testing were used. The course design and development process began in May, 2006. Production activities were completed in late November of the same year. This schedule enabled Seward to train the MOE team members on the use of the software prior to introducing the online teacher training to the pilot teachers in January.

**Capacity Building**

Twelve MOE staff members from the Curriculum and Human Resource Development Departments were identified as the MOE team members. These individuals had content expertise, teacher training experience, graphics production experience, and IT support expertise. Throughout the project, these individuals were engaged in both formal and informal capacity building activities.

Three formal capacity building workshops, designed to provide both education and experiences, were offered. The first of these was offered in December of 2006 and focused on the use of the pilot software, working with pilot teachers, and issues associated with technology-based training in Oman. The second workshop, offered in early May of 2007 introduced the MOE team members to the administrative interface of the LCMS that had been produced to enable rapid development of future online teacher training courses. To make the training more meaningful, participants entered content they had developed for three new courses. The final training, which was added later in the project to address knowledge and skill deficiencies that had been identified during the project, addressed basic instructional design models. This course was offered in late May of 2007.

Informal capacity building was accomplished through the use of a “gradual release” process. The approach was primarily applied to the design and development on online teacher training modules. Throughout the project, the MOE team was required to
assume increasing levels of responsibility for the completion of models. At the same time, the Seward team gradually reduced their production of materials and shifted their efforts to providing support to the MOE team. The first module, an Occupations unit in grade 11 English, was written by the Seward project team with input and reviews from the MOE team members. During this task design processes and procedures were modeled and the MOE team was exposed to the tools and techniques used in the design. The second module, a math unit on space geometry, was developed as a shared activity. The MOE team was responsible for some of the development while the Seward project team produced the other portion of the module and provided coaching and mentoring. The final module, a science unit, was developed almost primarily by the MOE team members. Again, Seward provided support and guidance, but avoided design and development work to the greatest extent possible.

Pilot and Evaluation
The online teacher training was piloted in three secondary schools in Muscat, Oman, selected by the MOE prior to the start of the project. All of the schools were located in Muscat and all were selected because they had internet access and computer labs. Once the online training had been developed, a day-long session was scheduled in early January of 2007 for the pilot teachers to come to the MOE’s HRD computer facility for orientation and registration. During this session they were also interviewed by the evaluator, Dr. Shirley Miske, and completed a pre-implementation survey. Unfortunately, a series of miscommunications within the MOE resulted in the wrong teachers coming to this session.

An alternative plan was put into place in late January and early February of 2007 to ensure the appropriate teachers were oriented and registered for the pilot. A process was put in place by MOE team members and the Seward project team members to identify teachers and to meet with them in their schools. At this meeting the project was explained, the teachers were logged into the software and registered, they completed the pre-implementation survey, and the classroom implementation materials were disseminated. The pilot teachers were asked to complete the online training and implementation (use of the classroom materials) by the end of April 2007.

In late April and early May of 2007, Dr. Miske interviewed teachers about their online training experience and the implementation of the classroom instruction. In addition, she examined online completion data and interviewed students about their perception of the instruction and the use of active learning methods.

Learning Content Management System
The LCMS was developed to enable the production and delivery of future online teacher training by the MOE team. Design of the course development portion of the LCMS was based on the content presentation needs identified during the design of the online learning modules. By deconstructing the initial three modules Seward was able to identify the content presentation and interaction models the training required. Based on these findings Seward created templates that would enable non-programmers to input and sequence displays and interactions to create new courses.

Design of the LCMS began in November of 2006 as production of the training modules was being completed. It continued through April of 2007 and was available for use in training the MOE team members in May. During the May training workshop, which served as a beta testing activity, a number of enhancements were identified and
documented that would facilitate course development, management, and reporting.

**Description of the Project Components**

Completion of the four sub-projects required eight significant components, or areas of work, be undertaken. This section describes each of these eight components, including the planned output, outcomes achieved, and challenges and lessons learned.

**Component One: User Interface**

The user interface is the visual seen by the user and through which the user interacts with the software. Production of the interface includes not only graphic image development, but also interface design. This takes into account how learners will use the software and the navigation feature required.

**Output Planned**

In consultation with the MOE teams’ graphic artist, the Seward project team planned to design and produce the user interface and navigation strategy to be used in the presentation of online teacher training content.

**Output Achieved**

Seward designed and produced the user interface and navigation strategy.

Mr. Frank DeMars, the Seward graphic artist, and Mr. Ashraf Suliman Hamed, the MOE graphic artist, worked to produce several drafts of possible interface designs/visual treatments that would be appropriate and appealing to teachers in Oman. The instructional designers and programmers from Seward discussed the navigational needs (e.g., menu, functionality options) for students to access and use all of the online features. These capabilities were built into the interface by the graphics team.

**Challenges and Lessons Learned**

**Graphical Treatment/Imagery**

The graphics team searched for current online materials in Arabic countries, especially Oman, to determine preferences for colors, imagery, and style. They found a limited number of website examples and no online teacher materials.

The graphics team members drafted the interface concepts using their intuition. These concepts were then presented to various groups and individual within the HRD and Curriculum departments in an effort to get reaction that would enable them to refine the visual treatment used in the interface.

**Right-Left and Left-Right Presentations**

Since the training content would be displayed in both Arabic and English, the interface needed to accommodate the reading direction. The Seward project team created a reversible interface that flips based on the language being viewed. Learners select the language they wish to see at any point in the lesson and the entire interface flips.

**Component Two: 13 Online Teacher Training Tutorials**

Tutorials were needed to provide learners with background information, pedagogical guidance, and models of teaching behaviors related to the classroom use of active learning techniques.

**Outputs Planned**

Seward planned the two following outputs:

The Seward project team planned to design and develop 13 online tutorials on active learning techniques and competency based assessment. Each tutorial would contain videos demonstrating the active learning techniques being applied in an Omani secondary school classroom.

**Outputs Achieved**

Seward achieved the two following outputs:
Seward researched and developed content for a tutorial overview of active learning and 13 tutorials on active learning and competency based assessment techniques. A total of 55 video demonstrations were produced in Oman’s schools. These videos demonstrate the application of active learning in both boys and girls schools. The videos were integrated into the tutorials. Each tutorial is approximately 10-20 minutes in length and contains an exercise at the end to check learner understanding of the content. The tutorials were titled:

1. Inquiry
2. Cooperative Learning
3. Minute Papers
4. Overview of Active Learning
5. Physical Modeling
6. Socratic Questioning
7. Project-based Learning
8. Role Play
9. Concept Mapping
10. Problem-based Learning
11. Competency Based Assessment
12. Conceptual Change
13. Journaling

Challenges and Lessons Learned

**Tangible Compensation**

Many international aid projects contain a budget with which to pay the domestic collaborators and to purchase of computers, software, books, or materials that will be left in a country’s schools. Oman seemed to have approached this MEPI project with the understanding that this would be the case (i.e., the participants in the project would “get something” for their involvement). MEPI projects, however, are partnerships. As such, it is expected that each partner would contribute to the project.

As the Seward project team prepared for the video shoot, the issue of compensation came up. Seward project team members were asked what they would give to the schools that participated in the video shoot. Seward explained that its contract prohibited such expenses. However, to avoid delays in the project aggressive schedule, Seward decided to purchase one laptop for each of the schools participating in the video shoot. These laptops were purchased with Seward funds and were not charged to the budget. They were presented to the school principals as gifts from Seward. This appeared to address the needs for this component of the project. The lessons learned is that prior to the start of a project, in-country partners needed to understand the limitations of the budget and agree to work within them.

**Component Three: Online Teacher Training Modules and Classroom Implementation Resources**

Teacher training modules provided training on how to implement a three-week long unit of instruction using active learning methods. The instruction provided information to orient teachers to the topic as well as day-by-day lesson plans for implementation. Many of the lesson plans included video demonstration of how the activity should be conducted in the classroom.

**Outputs Planned**

Seward planned the four following outputs:

1. The Seward project team members planned to work with Oman MOE team members to design and develop three online modules of instruction. The process would involve a gradual release method that would require the Omanis to become increasingly responsible for the development of activities.
2. The Seward project team members would start this activity by modeling the instructional design process to the MOE team members. Seward would be responsible for development of the first module—English. The MOE team members, specifically HRD training specialists and Curriculum
Department content specialists, would observe the design and development process so they could replicate it in the design and development of the math and science modules.

3. Seward planned to share the workload with MOE team members during the design and development of the math module.

4. Seward would assist and provide feedback to the MOE team in a resource capacity for the design and development of the science module.

**Outputs Achieved**

Seward achieved the following outputs:

- After discussions with the MOE leadership and team members, a gradual release approach to module development was approved. It was determined that the three online training modules to be developed were:
  - Grade 11 English – Occupations
  - Grade 11 Math – Space Geometry
  - Grade 11 Science – Circular Motion

- Working with MOE English team members, Seward designed and developed content for a three-week unit of instruction, incorporating active learning throughout the lessons in the unit. Seward created
  - A Student Activity book was created for use by students, containing information to be used for each of the 15 lessons in the unit;
  - A Teacher’s Guide was created to provide a reference and guide for use during classroom instruction;
  - The online teacher training module to teach and demonstrate with video vignettes how to incorporate active learning techniques and competency based assessment in this unit.

- The MOE team members took the lead on development of the math module. MOE math team members met with Seward project team members during June and September trips to Oman as well as communicating frequently via email. The blended team worked together to make videos of the lessons developed during a November trip. The blended team also worked together during a November trip to produce videos of lesson activities. The videotaped activities were used in the tutorials as well as being part of the online training for the modules.

- A Teacher’s Guide was created in both Arabic and English for the three-week math unit—Space Geometry. Blackline masters were included to be copied and used with students. The blackline masters included additional geometry problems created by the MOE team members.

- The science module was developed with significant input from the Seward project team. The blended team met during June and September trips to Oman as well as communicating frequently via email. They also worked together during a November trip to produce videos of lesson activities. The videotaped activities were used in the tutorials as well as being part of the online training for the modules.

- A Teacher’s Guide was created in both Arabic and English for the three-week science module. Several new
physics lab activities were designed cooperatively by the MOE and Seward teams. Blackline masters were included to be copied and used for as guides for the labs. Additional homework problems were also included in an appendix. The Teacher’s Guide focused on completing labs as structured cooperative groups with each student having specific responsibilities. This technique was in contrast to the reason students worked in groups formerly—because of limited lab equipment.

- The Circular Motion Unit also used educational technology whenever appropriate. Through the manual teachers were provided with lists of helpful online animations and websites to use with their students. For teachers who had difficulty accessing the web, diagrams were constructed to simulate the animations.

Challenges and Lessons Learned

Gradual Release
The gradual release model employed by Seward was only partially successful. Seward project team members found that more support and guidance was needed than originally planned. This was true of both the math and science modules. Although the plan was to have the science module developed with minimal input from Seward, the reality was that the MOE science team requires significant assistance.

The tight time table for production and the fact that the Seward project team was only in Oman at the beginning and end of the summer contributed to this problem. More contact time and less time table pressure likely would have yielded better results.

To provide additional experience in the design of online instruction, Seward received permission from the MOE to request the MOE team members design additional courses. These courses would be put online during the spring training on use of the administrative interface. Each subject area team agreed to design an additional teacher training course.

Workload among the MOE Team
Job commitments of MOE math and science team members affected their ability to be sufficiently involved with the project. Even though documentation approving their level of involvement was signed by the appropriate MOE individuals, the reality was the MOE team members were overcommitted. Production scheduling problems occurred, as some lessons the MOE team took responsibility for were not received on time.

In addition, the time table required that much of the production be completed during the summer. Seward learned that summer is not an optimum time to schedule meetings or intense project work with Omani staff, as many take their long vacations during this period.

To offset late arrival of some math and science lessons, the Seward project team took on development of more lessons than agreed upon in the beginning of the project.

Translations
Translation difficulties surfaced during development of the math and science modules. The English module was published in English only, so translation issues were not encountered during development of this module. Both the online and print materials for math and science required translation into Arabic.

While every effort was made to write clear and simple text, issues arose about how to translate certain words that were specific to active learning curricula. Seward’s translator disagreed with the MOE official on translation of some of the following technical or academic words: active learning, rubrics, problem-based learning, journaling, and
brainstorming. These words were essential in conveying the meaning of new teaching techniques presented in the modules. For example, the concept of “active learning” was translated as “effective learning” by MOE translators. The Seward translator translated the term closer to—“dynamic learning.” Seward agreed to use the MOE translations, but strongly encouraged the MOE to consider new translations for these words before a large-scale release of the training materials. Completion of lessons was delayed since several rounds of revisions to translation were often required. In addition, revisions to the text of both the online and print versions of the physics material were being submitted by the MOE team members after the deadline for such changes had past. Keeping track of all the versions of a document as edits were emailed back and forth for approval was also challenging as MOE team members had difficulty using the track changes features in the Arabic version of Microsoft Office Word. Using other approaches to document sharing, such as Google Docs, which allows simultaneous online editing, may eliminate some of the version control issues.

**Component Four: Course Presentation and Development Software System**

The time table for completion of the project required that the initial teacher training courses be in the final stages of development prior to starting work on the LCMS.

**Outputs Planned**

Seward planned to design and develop a software system that would:

- deliver the pilot online teacher training;
- enable course development by non-programmers;
- support future use of online teacher training in Oman.

**Outputs Achieved**

Seward achieved the following two outputs:

- Produced an Online Learning Tool (OLT) to deliver the pilot teacher training courses.
- Produced a LCMS and integrated it with the OLT to support future course development (by non-programmers) and delivery in Oman.

The Seward project team worked with the MOE team members who designed each of the courses to determine the functionality that would be required of the software. Then the Seward project team developed the code required to present the three pilot lessons. These lessons were developed first because of time limitations. The pilot lessons needed to be completed for the MOE team member training in December and access by pilot teachers during spring semester. After the pilot courses were designed and well into production, the Seward project team began design and development of the LCMS and the administrative interface. This portion of the system was completed and integrated by the end of April so that it could be used for training the MOE team members in early May. Post training revisions were made to improve the usability of the interface.

**Challenges and Lessons Learned**

**Time Table Pressures**

The short time table for completion of the project required some compromises in the design of the LCMS.

**Component Five: Master Trainer Training Workshop**

Master Trainer was the term general used in the project to describe the MOE team members of the development team. These individuals were identified as being responsible for supporting future online teacher training course development.

**Outputs Planned**
Seward planned to conduct a five-day Master Trainer Training workshop to build the capacity of 12 key MOE team members. Participants would
  
  - get their first exposure to the online teacher training;
  - be prepared to monitor and support the pilot implementation of the OOTT project;
  - receive project management and product dissemination skills through Seward’s continued capacity building efforts.

Outputs Achieved
The five-day training workshop was delivered in December, 2006 to 13 participants—MOE team members and the assistant director of HRD. The training provided the first opportunity to test the online training in Oman (development work on the software was all completed in Minnesota by the Seward project team). The workshop:
  
  - gave participants an opportunity to see the software that presented the content they had developed. This activity served as a beta testing (formative evaluation) of the product and yielded very important feedback;
  - provided a forum for discussing the pilot test of the training software and the classroom implementation of the module using active learning techniques;
  - included presentations and discussion on issues related to future development of online training and national dissemination.

Repeatedly during the workshop participants reviewed the content of the online training as part of the formative evaluation process. This activity also provided the opportunity to discuss all of the tool’s features and functionality. These activities resulted in critical feedback that was used to make the software more accurate, complete, and functional prior to the pilot test.

The workshop enabled the MOE and Seward teams to engage in planning for the pilot test. This planning resulted in the assignment of roles and responsibilities for MOE team members.

During the workshop, participants developed plans for an Online Learning Division within the MOE. Among other thing, the vision for this division was that it would be responsible for developing procedures for national dissemination of the OOTT project.

Challenges and Lessons Learned

Attendance for Training
Keeping workshop participants engaged in the workshop was a problem during the first couple of days of training. It became apparent that, because of the roles the participants had in the MOE and the volume of non-project work they were involved in, participants could not stay engaged in the training for a full day.

In an effort to compromise and to get their undivided attention when they were present, the Seward project team started the training 30 minutes into the workday and ended 30 minutes before the end of the workday. This gave participants time to answer phone messages and emails.

Scheduling of Breaks
Seward also found the scheduling of breaks was important. Seward had initially set the midday break at noon. After the first day, Seward adjusted it to accommodate the midday prayer time of participants.

Software Functionality
This workshop was the first opportunity to test the software with a group of people using computers concurrently in one of the MOE computer labs. Seward encountered a problem caused by having a proxy server controlling access from the lab to the internet.
In spite of Seward’s efforts during the training, it was not until the training ended that the Seward project team discovered the proxy server setup. During future training sessions Seward disabled the proxy server and the software functioned without problems.

Component Six: Pilot Implementation of OOTT Project

Pilot testing required the five participating teachers in each of the three pilot schools to complete the online instruction prior to using teaching the module using active learning techniques.

Outputs Planned

Seward planned the following outputs:

- Selecting and registering Grade 11 teachers responsible for teaching the topics addressed in the pilot
  - Confirming the MOE server and pilot schools’ computers and networks were operational
  - Implementing the pilot test of Online Teacher Training in these three secondary schools
  - Muhanna bin Sultan General Education Boys’ School;
  - Hafs bin Rashid General Education Boys’ School;
  - Ruwi General Education Girls’ School.
- Providing the instructional resources required for the classroom implementation
- Gathering baseline data from the pilot teachers to establish their knowledge and experience prior to completing the pilot project

Outputs Achieved

Seward achieved the following outputs:

- All of the equipment was tested and confirmed as operational prior to the pilot.
- The pilot project was implemented. Online training was made available to all 15 pilot teachers and they were provided with the materials required to use their new skills through a classroom implementation.
- Evaluation data was gathered prior to the teachers accessing the training.

The server at the MOE became fully operational and able to support the delivery of the online teacher training in the schools. A server Seward had been hosting from the UK became an alternate location in the event of server failure. In the school computer labs, adjustments and repairs were made to the equipment and systems so that teachers who would be piloting new teaching techniques with their students in classrooms could be trained to access the OOTT modules.

Teachers and classes were identified for the pilot, principals were briefed, and all of the necessary administrative authorizations from the central MOE were completed. Baseline data on all pilot teachers were gathered through interviews and surveys. The data collected established their knowledge about and use of active learning teaching techniques in the classroom as well as their teaching experience, previous computer use, and exposure to computer-based training.

All necessary materials (print and online software) to support teachers and students participating in the OOTT pilot in classrooms were produced and delivered.

In February, 2007 the OOTT Project pilot for 11th grade English, math, and science was launched at three Muscat secondary schools. The launch was conducted by the Seward project team and the MOE team. Teachers were asked to complete the online training and classroom implementation by the end of April.

Challenges and Lessons Learned
**Miscommunication through Numerous Translations**

The first attempt at launching the pilot failed due to miscommunication within the MOE. The MOE was asked to identify teachers for the pilot study and to arrange for them to attend an orientation session at the HRD computer lab. The request to Mdm. Janet Al-Lamki from Mr. Hilal Al-Siyabi clearly stated the grade level and subject area from which teacher needed to be selected. However, through a series of translations and misinterpretations of the request—which went from Seward to the MOE, to the Muscat Directorate, to the three schools, to the departments, to the teachers—information got lost. As a result, of the 15 teachers that arrived for the orientation, only two represented the correct grade and subject areas. The session was canceled.

Seward’s alternative was to arrange school visits to meet, qualify, and select teachers for the pilot. The selections were made by Dr. Thuwayba Al-Barwani, members of the MOE team, and Mr. Hilal Al-Siyabi. After the selections were completed, Mr. Matt Finholt, Director of Technology for Seward, returned to Oman to provide the orientation, register teachers in the system, provide training materials for the classroom implementation, and do a final check to ensure the school computers and networks were operational.

Well in advance of the orientation session, Seward should have requested a list of the selected teachers and the grades and subject they taught. This confirmation would have enabled Seward to confirm the correct teachers would arrive at the orientation session.

**Lack of Connectivity within the Participating Schools**

Prior to the pilot Seward had identified on-going, sporadic difficulties keeping computers and networks operational in the pilot schools. Seward worked with the MOE team to put a plan in place whereby a MOE technician would monitor each school to ensure uninterrupted service was available.

During the pilot, Seward monitored the online records of teachers to determine which teachers were actively engaged in the training. This monitoring revealed that not all teachers were active and those that were active were not completing all of their assigned training. When interviewed at the conclusion of the pilot, many teachers reported difficulty accessing the training from the schools. They reported computers were not able to connect to the internet, or that the connections were too slow to view the embedded videos. As a result, some teachers resorted to accessing the training from home or from cyber cafes.

Seward and the MOE should have been more diligent to ensure that on-going support was provided to the schools to maintain computer operation and connectivity.

**Component Seven: Workshop on Use of the Administrative Interface**

Training the Master Trainers to create new online courses was accomplished through a short workshop. During the workshop, the three content area teams began the development of the three new online courses they had designed.

**Outputs Planned**

Seward planned to design and deliver a five-day workshop on the use of the administrative interface for online course development.

**Outputs Achieved**

A course on use of the administrative interface was design and delivered to 10 participants from the MOE team. Workshop participants were trained on all aspects of the administrative interface for the LCMS. They learned the following tasks:

- Course Management - to create lesson pages by entering content (i.e., titles, text, graphics, videos, links), to order pages to create lessons, to combine
lessons to create courses, and to edit existing courses as well as how to publish, archive, and delete courses

- Resource Management – to add, edit, or remove a variety of resource elements associated with each existing course
- Curriculum Management - to combine courses to create new curricula or to edit, archive, or delete existing curricula
- Report Management – to produce reports for individual learners, courses, and curricula
- Administration – management of users, site pages, and access to the administrative interface for course development or editing

The additional course the team members designed between the December training and this workshop was input into the system as part of the training. Participants mastered the administrative interface quickly and began producing their new courses within a day and a half. By the end of the workshop all of the teams had made significant progress on the production of their new course.

Challenges and Lessons Learned

Proxy Servers are Prevalent and Problematic

On the first day of the workshop, which was held in a facility that was new to the Seward project team, Seward project team members discovered that the computers were connected to a proxy server. As mentioned earlier in this paper, Seward discovered in the December workshop that the proxy server setup in Oman was problematic for the OLT system. The proxy server caches pages and serves them up the next time they are requested rather than connecting to the internet to retrieve the page. When the proxy server setup was detected, the Seward project team quickly reset the server configuration and the problem was eliminated. A long-term permanent solution would be to update the server software in Oman.

Component Eight: Instructional Design Training Workshop

During the project instructional design methods had been modeled and explained, however, the MOE team members were eager to learn more. An additional workshop was conducted to provide a more academic introduction to the field.

Outputs Planned

Seward planned to design and deliver a five day workshop on instructional design for content creators on the MOE team.

Outputs Achieved

An instructional design workshop was designed, training materials were created, and the workshop was successfully delivered to nine participants from the MOE team. Early indications, through verbal comments and formal evaluation surveys, suggest that the training had a positive impact on the participants. Participants indicated a significant increase in knowledge about instructional design. They came away from the workshop feeling equipped to use and share instructional design methodologies in lesson and curriculum planning.

Groups of participants received a series of posters to guide and support future instructional design projects. They also were provided with several key instructional design texts as resources for further learning.

Challenges and Lessons Learned

Knowledge and Skill Development

Instructional design is a field of study in which it is possible to earn graduate degrees. Competent instructional designers have a combination of years of specialized education and on-the-job skill development. To prepare a group of MOE team members to be quality
instructional designers was simply not possible within the constraints of this project. Seward’s solution to this problem was to meet the participants at their current design level and move them as far as possible through a combination of modeling, experiences, training, and resources. Then, Seward encouraged them to continue their learning.

**Overall Lessons Learned**

Three on-going areas of frustration surfaced during the OOTT project, including

1. the expectation expressed by the MOE that Seward provided compensation to MOE staff for their participation in the project;
2. the gaps in project coordination which caused miscommunications among teams;
3. a lack of reliable internet connectivity in spite of repeated assurances from the MOE’s IT Department that all schools have ADSL lines.

**Compensation for MOE Project Participants**

Throughout the project, the MOE made repeated requests of Seward to provide compensation to the MOE team members. These requests came from the MOE as well as individuals. They were directed to Dr. Sales, Mr. Hilal Al-Siyabi, and members of the Seward project team. Requests were made to pay
- MOE team members who participated in the project as part of the capacity building;
- teachers and schools that participated in the video production to create model active learning vignettes;
- MOE translators whom the MOE believed were the only individuals qualified to translate the training materials (permission was obtained to pay one MOE translator for work he completed outside the regular work day);
- pilot teachers who participated in the online training and classroom implementation activities.

While many of the above mentioned individuals did make exceptional efforts to participate, as stated earlier – this was a partnership. Seward’s contract with Creative Associates explicitly forbade providing compensation to MOE team members. It is unclear if there was pressure from participants to receive compensation or if this situation was simply an expectation of the MOE based on experiences with other international projects. However, repeated explanation of the nature of a partnership, specifically the contributions made by each partner and the limitations under which Seward was required to operate, failed to convince the MOE that additional compensation was not possible. On future projects, Seward (although not directly involved in the partnership contract negotiations) learned that it needs to begin the project with a detailed review of the roles and responsibilities of each partner and contractor. More time spent at the beginning of the project, perhaps with a representative from MEPI or Creative in attendance, may prevent the pressures and tensions from surfacing later in the project around compensation of MOE team members or similar issues.

**Miscommunications – Gaps in Overall Project Coordination**

At several points in the project miscommunications or misunderstandings created difficulties. The most significant event occurred during the attempt to schedule the pilot teacher orientation. As detailed in the body of this paper, the letter requesting the pilot teachers’ participation in an orientation meeting was misinterpreted as it worked its way through the system. The result was that
when the Seward project team reached Oman, they found the wrong teachers had been invited to the session. The session was cancelled and another means of orientation was put in place.

There was also a significant misunderstanding about the nature of the project and resulting products. The MOE’s IT Department believed the OLT product was going to be a Learning Management System (LMS) when it actually was a Learning Content Management System (LCMS). Believing it was a LMS, they felt the project was in direct competition to effort they had underway to license the CENTRA LMS.

The LCMS, in fact, is much more of a complementary product than a competitive one. Once this difference was explained, communication with and support from the IT Department improved.

Future projects teams should have direct representation from the IT Department. This representation would help to eliminate misunderstandings and would smooth communications and support.

Additionally, no one from Creative or MEPI was available to attend the meeting first meeting between the MOE and Seward. During this meeting a number of issues came up that Seward was not able to address, not having been involved in the planning and partnership agreement. In the future, on sub-contracts, it would be beneficial to have a representative of the contracting agency at initial meetings to conduct introductions and address contractual questions that may arise.

**Connectivity in the Pilot Schools**

Connectivity in the schools was sporadic throughout the project. The reasons for this may be many – poor connections to the schools, faulty or low quality equipment, human error, etc. Whatever the reason for the sporadic nature of connectivity, it was a problem during the pilot and will continue to present limitations to the use of ICT until it is resolve.

Future ICT projects should be prioritized to ensure that basic infrastructure is in place and stable before efforts are made to develop and implement interventions that rely on the infrastructure for their success.
Conclusion

Each of the objectives for this project has been met and the project was a success. Online training on 13 active learning methods and sample modules in math, science, and English are available for use by Oman’s teachers. A cadre of MOE personnel has been trained and mentored in the design and development of online training courses. A tool to facilitate development of future online training has been provided to the MOE. The online training was piloted with 15 teachers in three schools in the Muscat area and the pilot project was evaluated. In spite of connectivity issues, the online training was found to be effective and desirable. That said, the technical infrastructure within Oman was found to be immature and unreliable. Before the Oman MOE can successfully make use of online training on a national scale, the technical infrastructure must be stabilized.
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Collaboration Environment Based on Grid and Web 2.0

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Abstract

Common interest centers specialized in training communities, such as secondary schools, university training institutes, have heterogeneous, rich and varied resources in contents. Yet in their assessment, these communities present very disproportionate results. The present article comes out with an apprenticeship and co-operation setting which is based on Grid technologies and uses Web 2.0. The new environment is designed to ease up communication between the communities and thereby reduce the gap between them. In a bid to achieve this objective, a set of technologies and tools is used. It includes domain ontology for the validation of course contents, intelligent agents for communication and guidance, extended Moodle platform for contents surfing, multimedia message services (MMS) for transfer and retrieving grid courses through the mobile phone.

Keywords: Ontology, Grid Learning Services, Intelligent Agent, Web 2.0, Multimedia Message Services (MMS).

Introduction

Today, emerging technologies like the grid and web 2.0, significantly improve access to resources. For instance with grid, it is possible for a user to run in a transparent manner a software in a distant computer without having to worry about material or software constraints (capacity of the processing unit, memory, computing power, etc.). That responsibility is incumbent on the grid load. Web 2.0 on its part enables the internet user to impact on the contents that it receives, thereby making him not only a mere consumer, but also a producer of resources. These characteristics of the grid and web 2.0 meet the present requirements of e-learning consisting in the collaboration and co-operation between all the participants and the learner as the centre of his apprenticeship. Furthermore, many training communities that share common interests like secondary schools and universities have numerous, heterogeneous resources rich in contents. Nevertheless, the problem encountered in reviewing these communities is that the latter present, for the same course contents, disproportionate results. For instance, in Cameroon, for the same national result, the success rate is sometimes far above average for certain schools and below average for others; this particular case can be observed through the statistics of the 2007 official exams published by the “Office du Baccalauréat du Cameroun” (Baccalaureate Examination Board of Cameroon, 2007). In
order to reduce the gap between these communities, our hypothesis is that, resources of each of these communities reside in the computer connected on the internet. This article thus puts forth an apprenticeship and collaboration environment named « Grid Environment for Learning and Sharing Objects between Training Communities » GELSOTC, designed to ease up inter-community communication.

GELSOTC is based on the grid infrastructure. It federates the following tools and technologies: domain ontology for the validation of contents, intelligent agents for communication and tutorship, Moodle platform (Moodle, 2008) extended to the “carte-web” (R. Yatchou et al., 2003) concept and to Web 2.0 for contents surfing and Multimedia Message Services (MMS) for depositing and withdrawing grid lectures via the mobile telephone. Its main objectives are:

- To enable training communities with common interest centers to regroup in networks in order to exchange training resources, create and put at the disposal of the network consensual contents, pedagogically rich and varied, to validate contents created by domain ontology, etc.

- To enable constituted members of networks: to learn, enrich various training contents of their networks, organize themselves into self aid groups, and seek available resources of their networks.

This article has been structured as follows: The first part of this paper presents the state of the art on the field of grid services for apprenticeship and briefly reviews the Web 2.0 concepts and its advantages for e-learning: the GELSOTC environment is presented in Part Two, including its interconnection and technical architecture. Part Three deals with discussions and the article ends by a conclusion and an outlook.

State of the Art

Computer Grid and its Apprenticeship Capacities

Grid Computing

From the numerous definitions of grid computing, we have retained Ian Foster and Keselman’s who define computer grid as an environment operational and heterogeneous architecture systems whose access is provided to the user under a unified form by software called Middleware (Ian Foster, 2001). The grid is often used to share free computing power of connected computers. It is based on a standard architecture called OGSA (Open Grid Service Architecture). It deals with architecture in layers whose services form the basis of communications (C. Kesselman, 1998). OGSA has a series of technical specifications which help to define an infrastructure in order to integrate and manage services within an organisation which is virtual, spread out and dynamic (Ian Foster, 2002).

Today, grid usage has spread out to other domains. However, our interest is on e-learning. Apprenticeship grids as they are often referred to help to share out learning resources, give room for the inclusion of constraints such as: ‘information access only when the need is expressed, the management of the access to the distribution network and safety. The above-mentioned constraints constitute the requirements of a learning model on information transfer. Apprenticeship grids are, on an architectural point of view, based on the OGSA extension called GLS (Grid Learning Services) (Roger Nkambou, 2005). This is an OGSA to which a layer has been added comprising basic services that enable sharing as perceived by e-learning (collaboration, e-qualification, co-ordination, etc) in a bid to ease up the circulation of the contents and share
apprenticeship issues and subjects. Grid presents so many advantages for apprenticeship.

**Advantages of the Grid for Teaching**
The grid is supported by a distributed architecture, as solution to the problems of the interpretability and heterogeneity. Its advantages are numerous. It permits: the access of a larger number of learning objects geographically dispersed, the coexistence of heterogeneous resources, the dynamic management of learning resources, the reduction of costs related to maintenance, the sharing of resources favoring the collaboration between learners and the other learning objects (B. Batchakui, 2007), the sharing of the knowledge of the learner personalized and contextual. Also, it creates a learning environment centered on communication and collaboration and consequently, reduces considerably the distance between the entities or actors of the training.

**The Environments of Grid for Learning**
Grid systems have been conceived in the domain of e-learning and their main objective is to enable their users to collaborate through exchange of learning objects. The stress this time is put on the user: the systems conceived save the latter from the overload of information in registering into the virtual organization and the contents offered take into account the profile of the learner. The environments that we have studied, those that have mostly struck us with respect to our objectives are the following:

- **DIOGENE** (Le CRI, 2002), (Beverly Wooolf, 2005): it is a platform resulting from a project financed by the European Commission which has as objective to conceive and realize an environment innovating the brokerage of the online training services, then evaluate it in real situation. It serves as a support to the learner all along his learning process, from the definition of the objectives up to the validation of the results, passing through the construction of the personalized training routes. It offers innovative functionalities, for example, the probabilistic modelization of the learners, the personalized adaptation of the training routes, cooperative learning and online guidance, the intelligent and assisted definition of the training objects, dynamic learning strategies, the management of learning objects, etc. The technologies used are metadata and ontologies.

- **Customized Grid Learning Services** (Beverly Wooolf, 2005): it uses the techniques of web semantics, ontology, and autonomous agents to supply a personalized approach of the services of the learning grid. The learners and the teachers access the cut according to their profile.

- **ELeGI** (Colin Allison et al., 2005): It comes from a European project and involves a learning system that refits on the grid, and delivers a content based on the abilities and competences of the students.

- **GRID-e-CARD**, which is a system based on the grid infrastructure and a set of P2P agents with the objective to bring together, in Virtual Learning Communities (VLC) the actors or entities of a learning environment on the basis of their signatures (knowledge acquired, future objectives, desired learning services, …) for collaboration purposes (Guy Gouardères, 2005).

- **DyColo** (Dynamic Collaboration Learning Object), it is a collaboration platform based on the Grid Learning Service which permits the learning entities and teachers to collaborate...
with the particularity that the entities which share resources are grouped together thanks to the services of e-qualification integrated into the GLS (Mirelle Audet and R. Nkambou, 2006).

The Web 2.0 and its Advantages for e-Learning

The Web 2.0 is an information-pooling concept which modifies our way of working and interacting with information. With the Web 2.0, the user is at the centre of the exploitation of the information given that he participates actively in the enrichment of the content that he receives. Contrary to the Web 1.0 which proposes only internet pages to be consulted, the Web 2.0 allows the user to react to information found on the internet. Access to the tools is at the centre of the utilization of the Web 2.0 for education: example, wikis, blogs, RSS lines, aggregators or personalized welcome pages (Isabelle Dremeau, 2007).

Learning is said to be effective when the activity of the learner is highly solicited, hence the necessity to reinforce the teaching model in use by pedagogic strategies which permit the student to be at the centre of the learning process. The Web 2.0 offers the possibility to the actors of the training to impact the content, through their remarks and annotations. It provides the learner with flexibility and a certain learning autonomy. For example, the learner can subscribe as a student to the RSS streaming to benefit from updates of the learning domain.

There exist environments of e-learning based on the Web 2.0, including among others (Isabelle Dremeau, 2007):

- “Wikipedia”, which is a freely distributable online encyclopedia project that any user can ameliorate. The content proposed is published under GFL(GNU Free Document Licence),
- “edtags” where teachers and students list the links and articles which they put at the disposal of the community,
- “Google for educators” from Google which provides educators with a space where they can find all the google applications, tools and services used for pedagogical aims,
- “Facebook” which permits the learners to exchange their notes and courses,
- “Podcast” of American Universities which distributes in audio or video forms their courses on the Net.

Regarding the grid environments for learning which have been presented, although the contributions are indeed very interesting, in most cases they are not yet effective. The groupings proposed for these environments are virtual organizations with inconveniences as they can have a very high number of members which does not facilitates the proximity learning. There does not practically exist environments offering the possibility to the communities that have the same centre of interest to group up in order to combine their efforts to converge towards the best results when we evaluate them.

The content is the central resource of a learning environment. Putting the course files online is not sufficient, we need to think of an actual intelligent space to use the content. We saw that there exists a solution with the platforms based on Web 2.0 but these platforms do not refit on a grid infrastructure, consequently their usage depends on the system that shelters them.

Through GELSOTC, we intend to make up, to a large extent, for the shortcomings raised above. As matter of fact, our proposal is based on a grid infrastructure and such enable sharing among heterogeneous environments. It offers a framework that permits the training communities to be constituted in a network to distribute their learning objects. Through the
service “study group” learners are permitted to constitute restricted working groups. GELSOTC constitutes an intelligent space for content management, it integrates the concepts of Web 2.0.

**Specification of the GELSOTC Environment**

GELSOTC is a software collection that regroups a platform of content management called “xMoodle 2.0” and the services of GLS:

- xMoodle 2.0 is the Moodle platform to which we integrate the concept of Web 2.0 and a navigation interface in the contents of training from different communities.
- GLS services includes:
  - Collaboration: it is a process of conversation that goes beyond a simple exchange of information for it takes into account the social learning context. Collaboration implies the adhesion of the community, the distribution of tasks, the sharing of knowledge and tasks in order to attain a common goal. Examples of collaboration include instant messaging, electronic conferences, forums, study groups.
  - Communication: when it has to do with direct communication between the actor entities (humans, hardware, or software) of GELSOTC, we talk of a pair to pair communication; in this case software agents are used for communication. For example the agent of recommendation plays the role of counseling and the agent of notification informs the learner of the rendezvous in a study group. More so, Multimedia Message Services also enable the communication with the server towards deposit and withdrawal of content.
  - E-qualification: it enables the individual evaluation of the actors during their evolution within their community. To this effect, it provides the learner with the best virtual organization, i.e. that which corresponds to the learning profile.

**The Objectives of GELSOTC**

The objectives of GELSOTC are situated at two scales: a macroscopic scale where it has to do with laying emphasis on the activities carried out in each training community; and a microscopic scale where there is the need for the exploitation of the existing services in order to respond to the needs of the distribution of the learning objects of the different communities.

**Macroscopic Scale**

On the macroscopic plan, GELSOTC puts at the disposal of the communities a common centralized unit called xMoodle 2.0. This is an extended Moodle, containing a navigation service in the contents, based on the carte-web concept and web 2.0. A carte-web enable us to have a reusable web interface to access any course of the learning environment and shared contents [19].

GELSOTC establishes relations between the following five types of actors: the learner, the teacher, the author, the manager of the community, and the administrator. Seen from the community angle, it enables the constituted collaborations network to:

- publish the pedagogic contents (courses, evaluation, etc) of the different communities,
- share their seminars and pedagogic meetings through the video conference service,
- organize evaluation sessions between the training levels,
• inform a given community it evaluation across the statistical data,
• Propose their laboratory or their library through the virtual reality service,
• facilitate the availability of competences through the services of recommendation agents.
• Inform the learners, teachers, or community managers of the availability of important resources: ensuring a permanent technological watch with respect to a particular need of the moment. The actors receive, when necessary, information through their mobile phones and they can equally access contents through the same channel;
• etc.

Microscopic Scale
On the microscopic plan i.e. with a regard to the actors of the constituted network, GELSOTC enables the latter to:
• constitute themselves in study groups comprising learners from different communities. These learners can plan their study sessions and be notified of the program and the study time through their mobile telephones by the notification agents of the system.
• to access resources of their study level in the constituted network. For a given study level of the network, we have as much content as the communities of the network,
• to access tutor-type resources or assistance through the recommendation agents,
• to navigate in varying course contents validated by the ontology of the domain,
• research learning resources through a research service based on the ontology,
• visualize the learning objects belonging to their virtual community,
• etc.

General Functioning
Logical Architecture of the GELSOTC Interconnection
The communities connect to the GELSOTC server and form with it the Grid. The network thus constituted consists of a server, the set of computers of the communities, individual computers, and mobile telephones.
At the middle of the above architecture (Figure-1), we have a principal server, which will contain common services, for example the management of the learning content xMoodle 2.0, the service of “recommendation agent”, etc. At the peripherals we have the secondary servers that represent the training communities that constitute a collaboration network (C1,C2,C3,…,Cn).

There exist three forms of connections to the grid:

- A user can be connected to the grid from a post of the local network of his training community. For example the post P1 of the community C1(P1.C1).
- A user can connect to the grid through his personal post. For example the post Pi of the grid (Pi,G).
- A user can connect to the grid from his mobile telephone. For example the post PT of grid (PT.G). The connection through the mobile telephone passes through a GSM modem that we have not represented in the diagram. This form of connection has a very important role for a country like Cameroon in which the use of mobile telephones expands day after day. The communities that don’t have internet can connect to the GELSOTC server through their mobile telephones. A stocking zone is reserved to them to permit them stock their resources. And so we can constitute a virtual grid. More so, the users can access the content, receive notifications or latest information from their mobile telephones.

Such an organization in terms of interconnection equipments is mapped a logical organization of the human entities that constitute the collaboration network. This second form of organization that present the functional view of GELSOTC is represented by Figure-2 below.

General Functioning Diagram of GELSOTC
The Figure-2 is a set of two big blocks:
- a block “clients” composed of four entities: the user, the study group, the virtual community, and the training community:
  - The user is a qualified user (the system masters its profile); he is either a member of one of the communities or a guest to the grid.
  - The study group is a regrouping restricted to at most 5 learners of the constituted network who have decided to work program in common.
  - The virtual community is similar to the virtual organization, it has to do with a regrouping of persons having the same profiles around the same resources. The number of members is unlimited.
  - “Training community P” represents a community in the real sense that has decided to form with some of its peers a collaboration network.
- a block “System” is composed of layers of the grid infrastructure: a lower layer composed of physical and logical resources (data and resource servers); a middle layer (Middleware) based on the standard OGSA; a GLS layer comprising the collaboration services, communication and e-qualification, etc; and the GELSOTC layer that is the shop-window or the interface with the user.

The user interacts with the system through the services. He can be a member of a community of the network or not, however it integrates one of the following five roles: learning, teaching, author, community manager, and administrator.

Use Case Diagram
The user interacts with the system through the services. He can be a member of a community of the network or not, however it integrates one of the following five roles: learning,
teaching, author, community manager, and administrator.

![Use case diagram](image)

**Figure 3**: Use case diagram

### Technical Architecture of GELSOTC

**Generalities**

GELSOTC has a technical architecture in layers represented by the Figure-4.
The Figure-4 is essentially constituted of three functional blocks:

- **A central bloc composed of:**
  - An authentication layer that permits the interconnection of guests or communities to the Grid.
  - A Middleware Grid layer which is the central element of the grid, in charge of communication and data transfer between the computers, components or programs. It is composed of the layers of the architecture.
  - A GLS layer that comprises the services of: ontology of the domain that validates the content, recommendation agents or tutor counselor and the notification agent, MMS (Multimedia Message Services), etc. This layer is the centre of the collaboration service, of e-qualification, and communication.
  - An applicative layer composed of the xMoodle 2.0, which is LMS (Learning Management System) situated at the heart of GELSOTC because of its capacity to produce learning contents.
  - And navigation IHM on the resources of the grid, that constitutes the desktop of a user connected to the grid.

- **A peripheral block in the direction of the compound communities:**
  - An authentication layer that permits a guarantee of security of access to the resources of the customer.
  - Of a Middleware layer, in charge of the communication and transfer of data between the computers, components or programs.
  - An agent layer composed of a management agent of the connected community who is the virtual representative of the community, and an actor agent that represents the user of the community connected to the grid.
  - A layer of services or shared objects that the community makes available in the framework of the collaboration.

- **A peripheral block in the direction of the user:** These users have at their
disposal internet connection on their working places and are connected directly to the grid; the users that don’t have internet can be connected to the grid from their mobile phones.

**GELSOTC Middleware**

The heart of the present environment is composed of the GLS and the Middleware layers. These two layers are based on the SOA (Service Oriented Architecture). We have opted in the framework of this work on the association of technologies JINI, OGSA, and RMI. For more of detail:

- **JINI** is a set of APIs and network protocols that serves the deployment of distributed systems. It is composed of several services put at the disposal of the users of the network. Its principal function is to respond to all the requests from the user. JINI proposes a means for the customers and services to meet mutually. It defines mechanisms that permit addition, removal and access to the services without however implicating an authority of central control. The execution infrastructure is formed from a protocol at the network level called discovery, and two protocols at the level of the object called: join and lookup (Valhalla GFBLOG, 2001). We adopted it because it is on one hand easy to implement and on the other, it simplifies the use of the Globus Toolit in supplying simplified interface of the available services of OGSA (Open Grid Service Architecture).

- **Finally, RMI or Remote Method Invocation** is a java API that permits the manipulation of distant objects in a transparent manner to the user (Invocation of methods of distant objects).

The GLS and the technologies presented above constitute the middleware of GELSOTC.

**Discussions : GELSOTC as a Model of Grid Learning Management System**

GELSOTC is a platform conceived to allow the constituted training communities to form networks of help: the communities can put at the disposal of their members, pedagogically rich and varied training contents. It is used to increase the performance of the communities of the constituted networks.

The main idea is to transplant an application of content management on a layer of the basic services used by the learners and teachers in situation of training:

- The learners through their computer reach the different communities where they find the corresponding resources to their profiles. They sail in a transparent manner in the contents formation without worrying about the system that shelters these contents.

- The teachers using their computer to put their teachings at the disposal of the communities. They can converse with the learners who are connected.

- The communities through their manager put at the disposal of the other communities a software resource, for example a virtual laboratory and virtual library.

The specifications above prove that GELSOTC would like to transform the office of:

- The learner in a virtual class. The learner can: have several teachers in his class, converse with the learners of his level, and especially form a study group with the learners of his choice.

- The teacher in a virtual school with virtual classrooms where he offers some teachings. The teachers can: put
their lessons at the disposal of the students of a given level, receive the feedback on the teachings published, teach several learners at a time, communicate with communities managers on pedagogical topics, etc.

- The community manager in a virtual school where he manages learners, teachers, and resources at his disposal for a good running of the school. He can: put at the disposal of the other communities the educational resources, inquire about the evolution of a virtual given class of his community, etc.

When we refer ourselves to the computer grid, it follows that the user can access in a transparent manner the resources which he needs. The above description shows that the actors don’t have to give an account of the technical disposals that permit them to enjoy the resources put at their disposal. Consequently, GELSOTC wishes to be a model of Grid for Learning Management Systems (GLMS).
Conclusion

The present work is the integration within a single environment that we have baptized GELSOTC, a technology of grid and Web 2.0 concept. The proposed environment permits the regrouping of the communities to a common centre of interest in the mutual-aid network and to widen to the maximum the exchanges between these communities. Therefore this provides the needs in educational resources of the communities of the networks formed. The communication and the interaction between the members of the different communities of formation are improved thanks to a panel opened to collaboration services:

- The learners of the different communities of the network have the possibility to collaborate among them following their knowledge level: they can share the points of view on a common topic from the forum, they can constitute a study group. At the time of the sessions of collaboration within such group they can contribute to the enrichment of the content.
- The trainers of the communities have the possibility: to harmonize their teachings at the end of the assessments made in common in the network of exchange or proposed in the different communities, to bring their suggestions on the contents proposed by their colleagues.
- The managers of the communities have the possibility: to share their experiences with their equals, to value their own community of formation from the results of assessment common and statistics of evolution of the learners in the groups of survey formed, etc.

This work is a contribution to the conception of a Grid Learning Service (GLS) with added value (with the presence of services as MMS, the study group, etc.). It reduces the transactional distances between the members of the grouped communities and consequently reduces the gap between them. We are very much interested in the specification of GELSOTC. The continuation of our works will be on the implementation: first the implementation of the middleware that coordinates the activities of the grid, and next the implementation of the interface layer (IHM of navigation in resources) and basic services such as the agent and ontology services. The project will end with the gradual integration of the usual collaboration services as messaging, chat, study group, etc.
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An Investigation into the Impact of e-Learning within Geographic Literacy on Oman Secondary Education

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Abstract

This paper examines the impact of eLearning tools and techniques to teach geographic knowledge, disseminating map skills and spatial thinking to secondary school students. Although there have been numerous research studies conducted in this area, this research focuses on the adoption of technology enhanced learning with the challenges and opportunities it poses within the Gulf region.

Previous research studies have highlighted the lack of specialised subject specific tools for geography education in both theoretical and practical skills within Gulf region. Therefore, this study proposes to develop a bespoke eLearning environment to support the teaching and learning of Geography. The system will be developed around the principles of Cloud Computing, specifically “Software as a Service” and will be based on both the educational and technical requirements gathered from a field study planned to take place in the Sultanate of Oman.

Introduction

The revolution of using technology to enhance educational practice in schools, colleges and universities to change the education system to adopt technological development in all fields. This review prepares the way for the discussion of the goal of this research, to investigate the development of eLearning systems to support education in Oman with specific reference to the ways in which the teaching and learning of geography are being enhanced. Thus, this research work aims to carry out, in the near future, a practical comparison between two samples. One of them will study traditional education without using any technologies and the other will study traditional education with the help of the proposed eLearning System in schools and universities in the Oman. The goal being to explore how the technology enhanced teaching and learning of geography (by the employment of the proposed eLearning system in the classroom) may benefit educational institutions. The proposed system will comprise a broad spectrum of teaching and learning utilities for students as well as course/module development and management for faculty. The inherent global reach of such a system requires architecture to match such requirements. That architecture is Cloud Computing which is discussed later in the paper along with related technologies and issues.

Technology Enhanced Learning
The idea of technology-enhanced learning can refer to learning resources which date back as far as the 1900’s where chalk and slate were used to teach instead of today’s pen and paper. The introduction of computer systems and later, the internet have caused a dramatic increase in the popularity of technology enhanced learning. The pen, paper and blackboards of the last century are slowly being replaced by tablet computers, laptops, smart boards and interactive online learning resources.

There are a variety of teaching aids, methods and techniques that are used to enhance the learning process, for example:

- **Learning resources**: the creation, distribution and access of digital content, tools and services.
- **Actions**: the communication, collaboration and interaction with software tools.
- **Roles**: the individuals effected by technology i.e. students, teachers and lecturers.

One of the main forms of Technology Enhanced Learning ‘TEL’ is eLearning/Distance Learning/Online Based Learning; these are umbrella terms which describe learning carried out at a computer, usually connected to a network, giving the user an opportunity to learn at anytime and from anywhere.

Over the last decade, instructional design for eLearning has been perfected and refined using established teaching principles, with many benefits to students. As a result colleges, universities, businesses and organizations worldwide now offer their students fully accredited online degree, vocational and continuing education programs. For example, Liverpool John Moores University offers fully online MSc courses in computing (LJMU, 2007).

There are many arguments that eLearning can have detrimental effects on students as they have no student-teacher interaction, this lack of guidance can lead to problem areas being overlooked by the software and therefore incomplete knowledge. However, the advance of web based technology has overcome the lack of face-to-face learning by providing and supporting real-time interactivity. This can be performed using some of the existing technologies, for example Wimba Collaboration Suite (Wimba, 2007).

Wimba Media Tools enable the user to teach and meet, live, online. The live virtual classrooms support audio, video, application sharing and content display. This enables users to add vitally important elements of interaction that simply cannot be provided in a text-based course. The user can personalise his/her online courses by holding live, online classes, office hours, guest lectures, webcasts and meetings.

Another example of TEL is CD-ROM technology which is used to create multimedia training programs. The integration of various media formats permits diverse content to be easily accessed by users in multiple ways to enhance the learning process. Interactive media often includes live action video, animation, graphics, text and audio to deliver training content.

Information and communication technologies can transform the teaching/learning relationship, both by reinforcing and augmenting the content provided in traditional ways and by developing new ways of teaching and learning. An ideal example of this is the country-wide use of smart boards in schools and universities; this combines several significant technologies to create an interactive teaching method.

The computer, which can be equipped with a range of interactive learning tools for almost any subject, projects its user interface onto the smart board using a projector which is
normally located on the roof as it needs to be correctly configured with the smart board.

The smart board which has touches sensitive functionality and communicates with the computer to control the user interface. This technology has proven to be very effective not only for interacting students but for the teacher as they can annotate lecture notes, show videos and present relevant information from a variety of sources such as the internet. Another benefit of TEL is that it has made learning much more convenient and portable, learning is flexible and can be structured around a day to day schedule which has enabled many parents to further their education while still caring for their families. Learning is also self paced which is a huge improvement from the classroom environment where teachers had to hold extra classes for students who learned at a slower speed. Portable computers are at the heart of most TEL. They allow users to work at home or while travelling as the user can download material to read on the bus or train etc.

**eLearning tools to support the Teaching and Learning of Geography**

The introduction of eLearning tools to the educational system has brought a new dimension to the teaching of geography. eLearning tools are believed to have the potential of livening the classroom environment by making teaching and learning more dynamic, interactive and innovative. Furthermore, it offers scope for the development of the creative mind, both for the teacher and the student. According to Kynigos (2003):

“Educational software needs not only to allow, but also to encourage, teachers to construct and to make changes so that they can devise the exact artifacts they want to use with their own students.”

Through rich, interactive multimedia-based activities and resources such as simulations and video clips, we can improve the learning process by changing the teacher’s role to become one of empowering users rather than passive consumers of existing educational material. Using information technologies in the field of the social studies such as geography contributes to rendering abstract phenomena and concrete concepts and increases students interest in social studies (Akengin 2008). Doolittle & Hicks (2003) stated that the United States National Council of Social Studies (NCSS) supports integration of technology into social studies classrooms to change the learning and teaching methods for the contents of the social studies course and relevant skills. Mason et al (2000) say that technology provides unforeseeable facilities in teaching the contents of the social studies when compared with the traditional classrooms. Where Akengin (2008) has emphasized using technology in supporting the principles of a social studies course. Likewise Rose and Femlund (1997) information technologies make meaningful, integrate and activate the learning-teaching process in achieving the principles for a powerful social studies learning. Bishop et al. (1993) confer how geographers for research, lectures and student analysis can utilize the Internet’s vast amount of climate and meteorological imagery and text (e.g. satellite images, radar summaries, air charts, meteorograms). Nellis (1994) argues that “through telecommunications, computer graphics, geography computer software, and simulations, as well as, GIS, GPS and remote sensing, geography educators and students can address a broader range of spatial questions than was previously possible” (Nellis 1994:36). Lynch et al. (2008) describe using eTools in the field of geography assists geographical visualization including animations along with cartographic and GIS...
technologies to explore and explain difficult dynamic concepts or events and to assist in observing patterns and processes and virtual field trips. They avowed that Mobile Phones/PDAs and the internet can be used to engage and motivate learners, anytime and anywhere.

Technology Enhances Geography Skills by Topic?

There are different Geography skills which are required in the United Kingdom’s GCSE (intermediate schooling level) Syllabus, these can be described as the following:

- Map Skills.
- Feature Recognition.
- Graph Skills.
- Essay Skills.

Map Skills

In general a geographer needs to have good bearings and map reading skills. Students need to understand compass directions, grid references and the map’s key and scale. They also need to be able to find features when given a map reference and describe a feature’s location on the map by giving a map reference. From a map they should also be able to pick out key information on natural features and types of human activity; is this rural or urban location?

This skill obviously uses a lot of visual sources such as maps and diagrams. The most useful TEL tools to teach this particular skill might be interactive systems based on either an offline or online model. The system could both teach and test the user by giving examples of map co-ordinates and how to identify features. The user could learn the material at their own pace and from anywhere assuming they have a portable computer. Once the user is confident that they have the required knowledge they could then test their knowledge using the interactive tool (self testing).

This interactive tool might be based in a variety of languages using a variety of software. The main purpose of the tool would be to present the user with a question and then ask the user to point out the map feature using the mouse to click on an image of a map or type the relevant co-ordinates depending on which skill set is being tested, as shown below.

Fig1 - Game of identify European countries
The purpose of this game is to identify European countries; the user can select which area to be tested on by clicking on the drop-down menu. The system then asks the user to locate a country, if the user clicks the correct area on the map the country will change colour and the user will be congratulated. If the user clicks the wrong area three times, the system will identify the country by highlighting it. This is a very effective method and is fully focused on teaching the user instead of making them click on every country. The information on each country also gives subtle hints to its location which is another attractive and useful feature.

**Feature Recognition**

Students need to identify natural features ranging from land formations to weather patterns; they need to be able to depict these features from various sources. These sources can be photographs, maps, diagrams or sketches.

This skill is a perfect example of how technology can enhance the learning experience of students. This topic is very similar to map skills; therefore an interactive tool would also be the best application method. The scope for interactive learning tools is huge but the game shown below makes good use of a simple concept:

![Plate Tectonics](http://www.purposegames.com/game/1806/info)

As you can see the system asks the user to identify a certain land formation or tectonic process. The user then clicks on the relevant dot, if this is the correct formation or process then they are congratulated and if they get it wrong three times the correct answer will be highlighted.

**Graph Skills**

Students need to identify trends or correlation in raw data by presenting them in a relevant graph format. The students then need to analyse the results to determine the correct solution for the given problem.

This skill requires more depth in the understanding of possible solutions compared to the other more visually based skills. Therefore in order to enhance the learning process, technology needs to be applied in the correct areas. Using a narrated video tutorial which uses interactive examples might be useful; the students could then use a separate
method such an interactive game to test their understanding of the material. This game could give a set of data and ask the students to firstly pick the correct type of graph to draw and then plot the points on it using the mouse. 

**Essay Skills**

To gain maximum marks in essay questions, students need to show a thorough understanding of the questions requirements as well as applying the correct knowledge in an understandable structure.

These skills are solely text based; therefore an automated system could be developed to both teach and test the student’s knowledge. The teaching system could show the students how they should structure their answer and what each type of question requires, this also could use a data store of past paper questions. To test the student a tool could be developed using the same principals as the example below:

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**Learning Method Review**

When researching various methods of technology enhanced learning which could be applied to a project of developing an interactive, educational tool to teach GCSE Geography, three possible systems were discovered.

- **Serious Gaming.**
- **Self Assessment.**
- **Interactive Tools.**

This section will now explain each method and give the positive and negative features of each. The aim is to decide which would be the most useful system and focus on how it can be applied to the proposed system’s requirements.

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**Serious Gaming**

*Fig 3 - An example of testing essay skills*


This was an effective method of testing users on their knowledge of various geography topics. Considering such system were the games could mark essay answers, after looking into the functionality of this system it was discovered that it uses a data store to match keywords to the users answer. This is flawed in some ways as users may have put the correct word in the wrong context etc., but on the whole this is a very interesting system, but need further improvement to overcome some of the mentioned problems.
A serious game is a term used to refer to software or hardware applications developed with game technology and game design principles for educational purposes. Serious games have the potential to significantly improve training and education activities and initiatives. You only have to observe an ‘average gamer’ at play to see that the computer & video game industry has more or less mastered the art of using computer technology to not only captivate it’s audience but to also persuade it to spend approximately £10bn a year to use it. An example of using such method is “the Ankara primary school geography game”.

Researchers designed and developed a three-dimensional educational computer game. Twenty four students in fourth and fifth grades in a private school in Ankara, Turkey learnt about world continents and countries through this game for three weeks. The effects of the game environment on students’ achievement and motivation and related implementation issues were examined through both quantitative and qualitative methods.

An analysis of pre and post achievement tests showed that students made significant learning gains by participating in the game-based learning environment. When comparing their motivations while learning in the game-based learning environment and in their traditional school environment, it was found that students demonstrated statistically significant higher intrinsic motivations and statistically significant lower extrinsic motivations learning in the game-based environment.

In addition, they had decreased focus on getting grades and they were more independent while participating in the game-based activities. These positive effects on learning and motivation, and the positive attitudes of students and teachers suggest that computer games can be used as an eLearning tool in formal learning environments to support students in effective geography learning.

Another good example of such learning system is "BBC Bitesize Geography Game". It was used as a fun way of testing user’s knowledge of GCSE Geography. The basic design element of this application is to make as many men face the same direction by moving only one at a time, this is against the clock and every minute or so the user is given information to learn and then they are quizzed on their geography knowledge to win extra time. If answered correctly the user is rewarded with time bonuses:
Overall, the system can be considered as a well designed learning tool which can hold the users attention, this is mainly due to the entertainment theme used. This tool while enjoyable is not focused at hardcore revision and more for recreational learning. In relation to the proposed system requirement requirements, this method gave a few useful ideas but it is too complicated and accident prone to meet the proposed system requirements.

**Self Assessment**

Table 1 - Comparison of the advantages and disadvantages of Self Assessment

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Encourages students to become reflective and self-critical learners.</td>
<td>Self assessment is totally dependent on the willingness of the students to participate (some are reluctant to do so) and on their integrity and honesty in carrying it out (some are less than honest in so doing).</td>
</tr>
<tr>
<td>Enables students to take greater responsibility for, and to become actively involved in, the ‘assessment for learning’ process that is now regarded to be such an important part of the education process.</td>
<td>Lack of human contact.</td>
</tr>
<tr>
<td>Saves time.</td>
<td>Limited feedback.</td>
</tr>
<tr>
<td>Feedback and results allow for performance review.</td>
<td></td>
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</table>

Mock exam questions are an example of using such methods of learning. This method basically uses a data store to ask the users past paper questions, when the user has typed their answer into a simple user interface the system then checks for keywords and marks the user.
accordingly. This marking system is flawed in some ways as users may have put the correct word in the wrong context etc. In considering such system, it can be said it is an interesting idea but the flaws were too major too ignore, simple keyword recognition software is not good enough for marking essay questions.

**Interactive Tools**

Interactive tools are specially designed systems which use a range of functionality to make the learning process as dynamic and effective as possible. The importance of interaction to learning was eloquently summarised by Confucius: "What I hear I forget. What I see I remember. What I do I remember always”

The nature of computer assisted learning lends itself to involving the student with the learning processes with tasks requiring actions and dependent on the actions the student may receive appropriate feedback leading to further tasks. This goal-action-feedback cycle may be followed in a simple series of interactive questions or a complex case study.

A common structure for an interactive learning tool is an online or offline content management system using a database back end to teach and test the user a variety of topics using a variety of techniques. A list of advantages and disadvantages of such system considered in the following table:

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feedback and results allow for performance review. Dynamic language allows for different features to be used. Simplified interactivity. Easily designed/maintained. Teaching and testing facilities. Content management allows for complex data flow.</td>
<td>Complexity of content management may lead to errors. Scope for features needs to meet time restrictions.</td>
</tr>
</tbody>
</table>

It can be considered as this method is the best as it allows the combination of the best features from other methods to one system. The content management will allow more dynamic data flow, thus leading to a more interactive and useful interface for the user. As it will be web based it will be available to anyone, anytime and from almost anywhere in the world.

**Overview of Cloud Computing**

Cloud Computing is a relatively new moniker for a computing model that has existed for some time but is only now evolving to the point where it is eligible to become commonplace. In general, Cloud Computing describes a computing model in which information technology systems are accessed purely over the internet, thus removing the traditional requirement to setup software or enterprise servers locally.

The internet based nature of Cloud Computing means that software becomes a service (Indeed SaaS or “Software as a Service” is a whole subset of Cloud Computing) that may be freely available to the public, available only to members of an institution or subscription based (Utility Computing covers the latter).

**Cloud Architecture**

The architecture of Cloud Computing is largely unremarkable in that the current trim
of the internet constitutes its primary component:
- The communications of Cloud Computing are a strong variation of the client server model.
- Traditional internet technologies such as TCP/IP and HTTP are essential to Cloud Computing.
- Newer internet technologies such as Web Services and AJAX facilitate richer system development.

The novel aspects of Cloud Computing revolve around service scalability and include revised usage patterns concerning both hardware and software. Cloud Applications are or should be hosted in massive data centers that provide high performance processing via a server farm, the redundancy of hardware clustering and multiple internet access channels, the high availability of backup power supplies and the practical and economic sustainability of sharing such resources and capabilities.

**Advantages of Cloud Computing Solutions**
Cloud Computing delivers (amongst others) the following advantages:
- The cost to the end user may be reduced as Cloud Computing vendors operate the entire architecture and users need only have access to the internet via a suitable client side application such as a web browser.
- All data and processes are server side so Cloud Applications can be accessed from any computer connected the internet whether it is a private PC, a public PC or individual users PDA/Smart Device.
- Cloud Applications can be hosted alongside each other in centralized data centers. By sharing resources such as processing, memory and bandwidth, costs may be reduced while performance, efficiency and scalability may be increased.
- The security of end users data is typically higher due to centralization
of data within data centers that have hive like security concerns than those of any individual Cloud Application.

**SaaS, PaaS & Utility Computing**

The Software as a Service (SaaS) model, sometimes also known as the Application Service Provider (ASP) model, is perhaps the most significant portion of Cloud Computing and encompasses most of the design and development considerations relevant to this paper. Platform as a Service (PaaS) is a branch of the SaaS model. The PaaS model exposes a complete set of tools and controls so as to support the entire software web development life cycle. This takes place without the need for any development tools to be present on the client computer. Effectively the developer programmes on the server directly and the server manages the entire process through a well defined workflow.

Utility Computing is the packaging of information technology services/assets, such as processing and data storage, as a subscription based service similar to a traditional public utility (such as electricity, water or telecoms). The Utility Computing approach has the advantage of a low or zero initial setup costs, thusly, Cloud Applications distributed through Utility Computing are simply provided on a pay as you go basis.

**Cloud Computing, Not Cloud Computing?**

There is a considerable grey area between the traditional eCommerce, web based, data driven site and a modern or projected Cloud Application. A cogent example might include long standing online services such as Hotmail (now Microsoft Live Hotmail). Hotmail has always been web based and its reach has always encompassed the entire planet. Its uptime has been 99%, it has historically been scalable to any demand and it is provided as a free service. So is it a Cloud Application? Probably Yes, but one should consider that its design and development has been solitary from other systems and only recently has it been incorporated into the wider family of the current Microsoft Live services, a true first generation Cloud Application Suite.

It is therefore not unreasonable to ascertain that Cloud Applications are either designed for Cloud Computing or upgraded/up scaled versions of existing online systems that may or may not already exhibit Cloud Computing like attributes.

**Proposed System Design**

The proposed system will be designed as an educational framework that supports rich extensibility by allowing plug-ins to be developed either in-house or by 3rd parties. It is envisaged that certain plug-ins will be applicable to all forms of educational use. These “common” plug-ins will developed alongside the framework and include:

- Materials Delivery/Presentation.
- Assessment Delivery, Monitoring & Feedback.
- Communications (eMail, Online Discussion Forums, Instant Messaging).
- Personal/Academic Development Management

**Architecture**

In terms of the proposed system’s target infrastructure, it, like many other web based systems will be capable of existing as a Cloud Application or not. Were a more traditional approach be adopted, it is probable that each specific institution that utilises the proposed system would need to host locally within their private network along with the likely option of also allowing secure external access.

- This approach requires considerable server capacity in processing, memory, storage etc. A proper redundancy and backup strategy would require multiple instances of
the same server/infrastructure configurations.

- Security would have to be managed in concert with other systems within the institution.
- Technical support may require direct or indirect intervention from software vendors and scalability would be limited to the specific capabilities of the servers in use.

It is also far less likely that effective power supply and internet connectivity backups are in place within an organisation that consumes information technology services rather than provides them. The Cloud Computing approach solves these issues by virtue of its native characteristics. A subscription based (Utility Computing) approach could charge based on a number of schemes such as bandwidth, server utilization or number of users.

**Implementation**

The proposed system will be developed using the Microsoft.NET family of development tools including both established and brand new tools and techniques including:

- **ASP.NET.**
  - The primary development component for web systems.
- **SQL Server.**
  - Enterprise database server with recently added support for multimedia formats, particularly useful when considering the media oriented content of the proposed system.
- **AJAX & SilverLight.**
  - Rich client side development tools allowing smooth user interfaces and elegant media handling, traditionally restricted to conventional application development.
- **Model - View - Controller (MVC Framework).**
  - Modular development model facilitating effective unit testing so as to ensure low bugs on release and superior modularity in development.

An interesting recent development from Microsoft themselves is the Azure Services Platform (a PaaS) which when complete will allow business web applications of all shapes and sizes to be developed and hosted within Microsoft data centers. They are then solely responsible for ensuring uptime, performance, security and scalability requirements. The presence of the proposed system on the Azure Services Platform will guarantee that the proposed system is a true Cloud Application. Figure 6 shows the main constituent parts of the Azure Services Platform.
Considering the considerable scope of features within the proposed system it is probably that most if not all the services shown below will be utilized by the proposed system.

- .NET Services and SQL Services are essential to the development process and will form the core of the proposed system.
- Live Services will allow for eMail, instant message, scheduling integration as well as synchronisation services.
- SharePoint Services can provide excellent collaboration and management support.

As each of these services is developed by Microsoft using their own .NET family of technologies, interoperability will not only be streamlined with the development of bespoke components of the proposed system but management of those complex enterprise services will be handled entirely by Microsoft considerably eliminating the cost of continuous function and maintenance.
Conclusion

It is obvious from the material above that interactive tools are at the forefront of technology enhanced learning. They are becoming more and more popular every year as universities develop and implement custom made educational systems to teach a variety of topics under almost any subject. The sheer level of dynamic functionality that can be used in an interactive system ensures that the users' learning experience is both enjoyable and effective.

The apparent advantages of Cloud Computing are being utilized in the development of robust eLearning software, initially to enhance the teaching and learning of Geography within Sultanate of Oman, but later to encompass all fields of education.
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A Special e-Learning Solution and e-Learning Objects

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Abstract
With this paper we aim at introducing a special e-Learning solution, Learning Objects. In particular this solution provides for the support of distance education in programming without permanent supervision by a teacher. We consider the specifics of knowledge to be communicated to students when learning programming languages and technology.

The Learning Objects are interactive visualizations of program code examples or programming tasks. They have been developed to help students to understand programming structures more easily. A Learning Object can cover any specific programming problem in any programming language. Learning Objects can also cover the problem-solving logic at the algorithmic level. A learning object focuses on one specific learning goal. Each learning object has to be independent, without links to other objects or resources. Thus for example, server-side generated web pages are not valid as Learning Objects. This independence ensures the real reusability of the learning object.

Keywords: e-Learning, Learning Objects, Distance Education

Introduction
A learning object focuses on one specific learning goal. Each learning object has to be independent, without links to other objects or resources. Thus for example, server-side generated web pages are not valid as Codewitz Learning Objects. This independence ensures the real reusability of the learning object.

Here we investigate the possibility to evaluate and afterwards to consolidate the different methods for the LO’s developed and for those still under development. The most important perspective for this research is the stringent didactical concept. According to it the understanding of the resources available in every modern programming language like Java or C++ and the memorization of the facilities implemented in the different development tools is of less importance. Appositively the growing/increasing the capability/ability to solve business or other problems has the top priority. Based on this we formulate the decisive features toward the development of the common concept for LO’s.

Learning computer science and especially programming seems to be a difficult task for students today. What is the best way to teach computer science to novice students is a question; many teachers have been considering recently and is even more relevant now, than a few years ago, when computer science no longer seems to be an attractive subject to university students in Western Europe, America, Australia, New Zealand and even other parts of the world. What can we do to help students to gain better understanding of fundamentals of programming and feel the joy of running programming codes successfully? The answer is not simple and depends on what you consider most important in teaching. An
object orientated approach or a procedural approach has been discussed and communication skills and collaborate skills are among many desirable skills computer science students should be trained in.

In the past decades the trend of learning supporting media went from a strict instructional design to Computer Based Training (CBT) and to the current state where it is enhanced by the medium Internet to Web Based Training (WBT). Today's claim of e-Learning is to achieve a maximum knowledge transfer with a minimum effort. Using the perspective and/or concepts of knowledge management one can speak about the knowledge generation regarding the students.

In the last years almost 250 LO's were produced within the scope of the Codewitz Project by several international teams. A detailed overview of the categories and numbers of the produced LOs is available on the Internet site of the project [1]. Characteristic for Codewitz Project is the fact that there exist only a few basic rules for the design of the LOs which caused a huge variety of solutions that have been developed. Besides implementing different user interfaces and having divergent levels of user interaction all solutions have their specific understanding of knowledge transfer and a corresponding learning philosophy. All the experience gathered by producing and using these LOs need to be sorted and evaluated. Some of our evaluation results regarding in the project implemented LOs we presented before on several conferences [2], [3].

Accepted and mainly applied in distance education today the concept of blended learning allows the usage of various content available on the WEB. Just because the growing part of it is the open source and can be used for free [4] we observe the occurring wide integration of this open content into e-learning applications. But even if one can find in Internet encyclopedia like Wikipedia [5] well described and presented documents about all possible topics they are not a priori prepared/designed for learning as we defined it before – for empowerment to solve tasks or problems in particular situation or under special circumstances. Because of primarily orientation of Internet encyclopedia on scientific description of objects, events, processes, etc. they will never compete with FAQ which support the solution of real problems or tasks in the business and in the everyday life. From our point of view the acceptable distance education in general and e-Learning in particular has to combine both scientific and application oriented approaches. Especially important is it in such service oriented areas like programming skills.

**e-Learning Tools, Learning Objects**

A learning object is the name given to a course module, or to a completed lesson. This is a component of a Learning Management System that allows student progress and generates reports of his activity. The learning object is designed for a specific task, in maximum 30 steps or screens, at most 15 minutes. One of the main characteristics of a learning object is the portability. That means to be independent of other learning objects, to not refer to other files and to not access a database. A learning object should not contain any security settings to be access in a web-base interface.

Using learning objects, the structure of the course is flexible and the course can be restructured any time. Other advantage is a result of the portability: the learning objects can be moved to and run from any machine. The structure of a learning object might include an estimated completion, a summary of objectives and an introductory paragraph in the subject. For the best practice to maintain the attention of students, it is important to be concise, to use pictures or graphic representation. Printouts are necessary to reduce the stress of the audience. Simulation and animation are very important especially
in engineering object courses as well as interactive assessments to determine student understanding. Learning and testing should be separate learning objects. In this contribution, there are presented some technical details organizing a learning object.

The students of basic programming courses usually do not make much progress. To improve the students’ progress we start to produce and evaluate unique illustration, animation and visualization aids for students and teachers of computer programming, who are involved in the field of professional and/or higher education.

In the Codewitz Project the didactical approach for users is the following: depending on the main topic they seek help for, they can choose between a numbers of sub topics and then get a choice of several LOs that possibly deal with their problem. This hopefully results in having exactly one LO per request.

This approach can lead to some problems caused by the variety of implemented LO solutions. For example some of them are strictly designed for the use in class, i.e. they cannot be used for non-supervised distance education. Others are designed for distance education but lack a detailed explanation or supporting graphics so that the learner cannot get the answer he is looking for.

On the other side there are also some objective problems in communication and/or understanding between experts and students. If the placements of the particular LO in the hierarchical structure developed by expert disagree with the view or problem understanding by students possible they will not find this LO. Similar situation could appear if the context of presented explanation differs from those one learned by students before (may be in another lecture with another teacher).

In many cases students (together with teacher) are able to master such difficulties. They use their general capability – intelligence – to think abstractly, to interpret the given explanation according to the own view and so on. Starting our analysis from the point that programming is not the topic for especially selected students with certain intelligence level but the regular service subject concentrated on utilization of programming tools to solve the (business) problem, we emphasize following feature to be integrated in the (future) Codewitz didactical approach:
The LOs (developed and under development) in Codewitz are and will be used for academic education. Consequently there have to be one (or a small number of) appearance, navigation and interaction metaphor as well as one concept for task/problem formulation and offered explanations.

Summarizing we can formulate that for opening the Codewitz platform to a wide usage in various communities it is necessary to bring more flexibility into the one (or few) selected (strict) didactical approach. This can be realized for instance through involvement different views on the topic especially in respect to all possible praxis tasks where the selected LO could be used. Additionally the developers of LOs have to take into account diverse potential perspectives used by lecturers as well as by students according to their knowledge, experience, learning and intellectual capabilities. All this information is to be involved in explanations but also in visualization of programming knowledge to be submitted to students.

By reducing complexity in learning computer programming these aids, referred as Learning Objects help the learners to better understand and master, and the teachers to better explain and illustrate the problems connected to the use of basic and advanced structures in computer programming. The learning objects discussed in this paper are from the Codewitz (www.codewitz.net) project which is a Minerva Socrates project that emphasizes developing and producing interactive web-based learning objects for programming courses.

The idea of the program visualization learning objects is debugger like step-by-step program execution in both forward and backward directions (Figure 1). The program code is highlighted in each important step of the program execution and the run of the execution in code is also visualized by arrows when necessary. In each step of the program execution console is visible as well as the memory area. There are also areas for the conditions and for the short explanations of the current step. The memory part is the only...
one where the layout can be changed according to the subject as learning goal. These changes appear for example in case of arrays when the structure of the array is visualized.

The design of most of the objects is similar to the one in Figure 2 but some have a slightly different design as can be seen in Figure 3, where the task is explained for an exercise and a feedback given.

Learning objects in the Codewitz project are web-based standalone visualizations of programming tasks or code examples built for clear specific learning goals. The Codewitz learning objects are so far mainly for supporting C++ teaching and learning but some of the objects are also for teaching/learning Java.

At the end of the project as many as 178 learning objects have been made and they are accessible through the project’s website where pans for about 400 new objects can also be found. Figure 1 shows an example of a learning object which explains pointers. Here we can see that the object has an area for input/output from the student, execution that shows step by step what is going on and an area for Memory and Conditions. Many of the objects also have an explanation area.

To make the objects the partners could use different methods or programs and most of them used Macromedia Director so many of the objects need Macromedia Shockwave to run but some are made with Flash and some with Java (Figure 4).
The LOs (developed and under development) in Codewitz are and will be used for academic education. Consequently there have to be one (or a small number of) appearance, navigation and interaction metaphor as well as one concept for task/problem formulation and offered explanations. Summarizing we can formulate that for opening the Codewitz platform to a wide usage in various communities it is necessary to bring more flexibility into the one (or few) selected (strict) didactical approach. This can be realized for instance through involvement different views on the topic especially in respect to all possible praxis tasks where the selected LO could be used. Additionally the developers of LOs have to take into account diverse potential perspectives used by lecturers as well as by students according to their knowledge, experience, learning and intellectual capabilities. All this information is to be involved in explanations but also in visualization of programming knowledge to be submitted to students. By reducing complexity in learning computer programming these aids, referred as Learning Objects help the learners to better understand and master, and the teachers to better explain and illustrate the problems connected to the use of basic and advanced structures in computer programming. The learning objects discussed in this paper are from the Codewitz (www.codewitz.net) project which is a Minerva Socrates project that emphasizes developing and producing interactive web-based learning objects for programming courses.

Fig 3 Types of learning objects
Case of Study

The study was organized on the same course in two years. In the first year students do not have the program visualization learning objects as learning material available and in the second year they have the program visualization learning objects available. The students study exactly the same course. The effects of the program visualization learning objects on the results are then analyzed by the final course points and grades and activity of the students and also with a survey about all learning materials available held at the end of the course.

The study was conducted in Technical University of Civil Engineering during years 2005-2007 for distance learning students who are involve in Romanian project (PIR) for rural education (225 students). These civil engineering students have one obligatory programming course included in their studies. This course is called Programming Language and the course covers the first steps of programming like variables, selection, loops, arrays and functions. The Programming Language course is timed in the second semester of the second year of their studies and the scale of the course is three credits. The course consists of lectures and lab exercises. Each student has 28 lecture hours and also 28 lab hours.

Each year three groups of around 75 students are formed. The groups have the Programming Language course parallel with the exactly same content. It is assumed in the course everyone has no previous knowledge about programming.

The organization of the study was divided in two years. In 2005-2006 the students had the courses in a traditional way with no program visualization learning objects available. The 2006-2007 courses were organized with program visualization learning objects available.
available for the students as learning material in the local network throughout the course. In 2006-2007 all the students were guided by the teacher to use the learning objects as the extra learning material. The program visualization learning objects were occasionally also used as program examples by the teacher. The both year courses were held by the same teacher with the same material and with the same outside classroom assessments for the students. At the end exactly the same paper exam was given to the students in both years. The exam papers were not given back to the students. Thus the questions in the exam are considered not to be known by the next year students.

This study consists of two parts. The first one is the results of the courses in two years. The first study takes also into account also the activity of the outside classroom assessments made by the students during the course. The second study is the survey made for the students at the end of the course. In this survey the students answered to the questions concerning their background and the usefulness of different kind of learning materials in their learning process. This survey was conducted during the last lessons of the course.

The results consist of the final grade and the activity of the students. Final grade is between 1 and 10 where 4 is failed, 5 first grade for the completion of the course and 10 is the best grade (Figure 5).

In the survey the students were asked about their programming skills before the course, about the skills in using computers in general, about all learning materials used in the course and program visualization learning objects (used only in 2006-2007 courses). The survey result about visualization learning objects was very good (Figure 6).
Fig 6 Survey result about visualization learning objects
Conclusion

The gathered experience provides a profound basis for the improvement of the LO implemented in the Codewitz Project regarding their quality and quantity. The significant step on this way is to make use of the knowledge and experience of additional experts (like linguists).

Our future activities within Codewitz will respect the discussed guidelines to improve the production and usage of LOs. After the necessary adaptations to the Romanian learning culture the produced LO increases their potential to be applied in university and additional education in Romania.

Interactive learning object is an idea that many teachers welcome in their search for new methods and support for novice programming students. What subjects to explain with the help of learning object is always a question and in the Codewitz project the need analysis was helpful for the project partners to choose where to begin. To introduce the learning objects to teachers and students is still an ongoing process and all teachers can become partners in Codewitz, get access to the material bank and take part in developing more interactive learning objects. It is quite clear that students believe that learning objects can be useful for them as novice programming students. But it is also quite clear that more introductions and better integration of learning objects is needed to encourage students to use them more frequently as a normal part of their programming study. Only a part of the students seem to use extensive material outside the classroom and although they know about good material they somehow do not use it. Here we might have to deal with students learning style and their immaturity as learners. Codewitz learning objects are not the witchcraft we might need in teaching programming today but I believe it could be useful especially if it becomes integrated into teaching and learning and a natural part of students programming life.
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The Best of Both Worlds: Lectures and Facilitators

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Abstract

There has been an effort in the eLearning Industry to convert trainers and teachers, who impart knowledge, to facilitators, who assist in learners to gain knowledge. This has left a gap where there are accomplished trainers, but who have not been able to move on as facilitators. These trainers own immense knowledge and teaching techniques, but the eLearning industry is unable to capitalize on their experience.

This research paper will try to convince the audience about how we can utilize the knowledge and expertise of these trainers without them having to learn a new teaching paradigm. How we can benefit from their area of relative advantage. It will list innovative tools and techniques which can allow us to accomplish this goal. It will try to change our mindset that we can have either Trainers OR Facilitators showing us the power of AND: How we can have Trainers AND Facilitators - The best of both worlds.

Problem

Because trainers have years of experience working in traditional environments, they usually do not have much exposure to new teaching technologies and hence are not very tech savvy (Thomas Spotts, 1999).

“Despite research and testimony that technology is being used more by faculty, the diffusion of technological innovations for teaching and learning has not been widespread” (Jacobsen DM, 1998).

Trainers are more used to delivering an effective lecture by utilizing established non-technology methods involving the use of hand movements to convey their message, using a variety of vocal tones to create an experience of storytelling and to show emotion, using body language to communicate non-verbally and so on. These can be regarded as training aids. Most of these complimentary training aids are part of an act that the trainer performs, just like a theater performance.

As a traditional trainer, this ability of giving an experience is their “Area of Relative Advantage”. This is what sets them apart
from the any Subject Matter Expert. This experience and ability of trainers is untapped in the elearning industry. Trainers are usually taken on board as facilitators and given a group of technologies with which to educate the learners. So, in the e-Learning environment, this ex-trainer now feels out of place and unable to practice what they know how to do best, viz. giving the learners a lecture experience performance. Such performances have great impact on learners but the eLearning environment currently does not recognize this and does not give them that setting. For example, the physical space around the trainer for the trainer to move around is non-existent for recorded lectures. Even some live lecture setups have space restrictions. Trainers, in an eLearning environment have been reduced to monotonously reading off presentations. To summarize, the trainers are unable to practice giving a teaching experience because they have forced to change their ways to shape with the technology they are enforced to use. The root cause of the problem is technology and it misuse. Even though technology is regarded as an aid to teaching, apparently it is not aiding the trainers (Geoghegan, 1994)

Solution
The solution to truly aid the trainers is to mold technology (as opposed to trainers) to facilitate the trainers. We have been using the wrong approach by bringing in technology and expecting the trainers to adopt. And the most important way we can do that is by making technology “transparent” and not intrusive. Technological tools should aid us without getting in our way.
So, we need to analyze the teaching patterns of trainers in a traditional setting and make sure that they are able to use the same old techniques.
Keep in mind both in-class audience and remote audience

Boards
The trainers should be able to write on boards and have all their writings transmitted. The board should be constantly visible to the learners in and out of the classroom. This would not have to be video because of the low resolution, rather stroke capturing done transparently. If special markers are required, for them to qualify as transparent technology, there will need to be as easy to use, find and procure as normal board markers

Presentations
The computer presentations should similarly be viewable in-class transmitted to remote learners as well. The configuration of this setup should again be transparent and the trainer should just have to open their presentation. The process should not involve uploading the presentation, importing files, and other technical activities which hinder the process of starting the training.

Storytelling
The trainer should be able to freely move about the classroom, instead of being limited to sit on a chair, or to just stand in a particular location or to just move about a certain strip, etc. The trainer needs to be able to move about and interact with the existing learners in the classroom. The trainer should be able to sit in various locations of the room. The trainer should be free to do demonstrations in the classroom the trainer is standing in one location and he requires the learners to focus on another area of the classroom (hence people tracking cameras are not useful in this scenario).
While at the same time all this should be captured by a ceiling mounted camera in high resolution and broadcasted along with the presentation and the whiteboard. The Video will need to be widescreen aspect ratio to maximize the area to be captured, while being able to discard the ceiling and other elements which are not required.
Learners in Class

Preferably there should be at least one learner in the physical classroom so that the trainer can interact with the learner. The objective is so that the remote learners are able to get the same interaction experience that the trainer is using with the learners in the classroom. In an empty classroom, the trainer will never be able to create an experience of storytelling because of the lack of other human beings as an immediate audience.

Eliminate Separate Recording

For the same reasons as above, we can now eliminate separate recording sessions for “high-quality recordings”. An isolated recording session only captures a monotonous reading session, which the learners definitely do not want [ref]. These separate recording sessions also do not have the same whiteboard and presentation experiences as of a live classroom session.

Learner Point of View

On the Learner end, the Whiteboard, Presentation and Video (of the complete classroom, so that the trainer is able to do demos) should be shown on one screen, without other distractions (Figure 1).

Since this live classroom could potentially be broadcast to a huge number of Learners, there naturally will be a correspondingly huge number of queries and questions from Learners. Allowing questions from learners would distract the Trainer to the point of not
being able to deliver the lecture. There are two proposed solutions to this:

1. The instant-messaging / chat questions can be answered by a teaching assistant who will be logged on during the entire class and act as a “facilitator”.

2. The questions and answer session can be scheduled after the lecture and the questions can be answered directly by the trainer, or they can be moderated by the teaching assistant sitting in the class, while the trainer can answer the questions on video, instead of text replies.

If we imagine a perfect classroom, where the trainer is delivering a lecture and all aspects of that lecture (Audio, Video, Emotion, etc) are being captured, transmitted and absorbed by remote learners, it seems very simple. It is extremely simple to achieve this, yet we as an industry have not yet been able to achieve this. There are numerous tools, like smart boards, tracking cameras, multicasting broadcast services, etc which are designed to assist in what we are trying to achieve, yet these tools are so clumsy and difficult to use that they are a hindrance rather than assistive tools. Currently the trainers need to be trained, they need technical assistants, they need to configure tens of settings before starting the lecture, are limited to standing in one location while the lecture is being recorded, are not able to use the whiteboard the way they are used to (have to resort to clumsy small touch screens, etc) and so on.
Conclusion
Currently, the eLearning industry is facing the challenge that trainers are not effective as facilitators in an eLearning environment, because of their lack of technology experience. Hence they have tried to hire “facilitators” instead who guide learners towards knowledge resources instead of imparting knowledge. Due to this trend, the eLearning industry is missing out on the ocean of knowledge and teaching experience a trainer brings to the classroom. Therefore, these trainers remain with the traditional brick and mortar educational institutions since there they are able to practice the area of expertise where they have a relative advantage. This results in the traditional brick and mortar educational institutes have an definite advantage over eLearning institutions which leads to lower adoption of eLearning (Ebersole, 2003).
Trainers should be attracted to eLearning institutions by making their transition easy and this can be done by implementing “transparent” and non-intrusive technology so that they can continue using their own techniques which they are familiar with. This will increase the number and quality of trainers in eLearning resulting in higher adoption of eLearning overall.
References


A Case Study of Training Indian Insurance Agents

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Abstract
The learning capability of individuals does not depend only on their own learning and assimilating capability; it also depends on the manner in which a subject matter is presented to them. If it is presented in an easy-to-understand model, it becomes easier for the learners to connect themselves with the subject matter.

Keywords: e-learning delivery innovation, game model, test bench, structured model, unstructured model

Introduction

I Guru Test Bench is one such product, which gives an easier and clearer understanding to different segments of the target audience with different learning styles. The authors have extensive experience in training of insurance agents since 2003. They are well conversant with the problems faced by the insurance sector with regard to its agents’ training. The authors have attempted to present a live case study of a product that has multiple delivery models to suit the needs of the heterogeneous target audience with a single set of content.

This paper consists of three parts:
1. Part 1 – Covers the regulatory background of Indian Insurance Industry and mandated agency training.
2. Part 2 – Covers Insurance Agents’ profile, problems in agency training both from the agents and the insurance companies’ point of view.
3. Part 3 – Covers the C & K solution that addresses the problem by developing a product that is delivered through multiple models.

Part 1 – Regulatory Background of Indian Insurance Industry and Mandated Agency Training

Insurance Industry in India

The year 1956 saw the nationalisation of the insurance industry in India. All the then 250+ existing life insurance companies came under one roof under the name The Life Insurance Corporation of India (LIC). Almost for four decades, the LIC was the only life insurance company catering to the insurance needs of the people. This monopolistic status continued till 1999 when India ventured out on the path of liberalisation, globalisation and privatisation of several industries including the insurance sector.

During the year 1999, in line with its liberalisation policy, the Indian Government decided to allow private players into this industry. At this time, the Insurance Regulatory & Development Authority Act, 1999, was passed and a regulatory body was constituted to regulate and ensure an orderly growth of insurance industry.

This historic move resulted in a sea change the way the industry operates. Foreign Direct Investment (FDI) was allowed up to 26%. Most of the Indian companies joined hands with international players who brought in the required capital and also their rich experience...
in insurance management, leading to a leapfrog growth of the industry. As of June 2008, there are 21 life insurance companies operating in the Indian insurance market. With the population size exceeding more than a billion and over 6% economic growth in all sectors, there has been an increased employment, which, in turn, resulted in higher disposable income. This has created a largely untapped insurance market. With such a huge potential, Indian insurance industry provided a wide opportunity for national as well as foreign players. The premium underwritten as on 31st March 2007 stands at Rs.1.56 trillion (USD 3.1 billion). India is the fifth largest life insurance market in the emerging insurance economies globally and is annually growing at 32-34%. This impressive growth in the market has been driven at a fast pace by way of introduction of new products, enhancing product awareness and promoting consumer education and information. In addition, the saturation of insurance markets in many developed economies has made the Indian market more attractive for international insurance players.

Insurance Legislation

Insurance is a federal subject in India. The primary legislation that deals with insurance business in India is: Insurance Act, 1938, and Insurance Regulatory & Development Authority Act, 1999, which constituted the Insurance Regulatory & Development Authority (IRDA). The main objective of IRDA is “To protect the interests of the policyholders, to regulate, promote and ensure orderly growth of the insurance industry, and for matters connected therewith or incidental thereto”.

Agents’ Training

Insurance is a business of solicitation. The Insurance Act defines an insurance agent as one who is licensed under Section 42 of that Act and is paid by way of commission in consideration of the agents’ soliciting or procuring insurance business. He is, for all purposes, an authorised salesman for insurance and needs a license to sell insurance products. As part of its regulatory role, IRDA has realised that the country is in need of millions of agents, who are directly in touch with the general public. They are the first contact in canalising the huge amount of public money into the insurance companies. IRDA felt the need to educate the agents and for the purpose issued the IRDA (Licensing of Insurance Agents) Regulations, 2000, which deals with the issue of licenses and other matters relating to agents. The regulation includes:

- Mandatory Training of the Agents: This clause requires that all insurance agents should undergo a training for 100 hours (later changed to 50 hours since November 2007) and obtain sufficient insurance knowledge.
- Authorised Training Institute: The agents should be trained only by training institutes authorised and licensed by the IRDA for that purpose. The training institute should fulfill several conditions before they are authorised by the IRDA. However, the institutes can offer offline classroom or online training subject to fulfilling the respective regulatory requirements
- Final Examination: After undergoing the mandatory training, the agents should complete the learning process by passing an exam. IRDA has authorised The Insurance Institute of India (III) to conduct these exams. The III was established in the year 1955, for the purpose of promoting insurance education and training in the country. It conducts exams for prospective agents across India by appointing franchises who, in turn, have established authorised test centers.
Agents Profile

The minimum academic qualification required for becoming a licensed life insurance agent is a pass in Class XII (urban agent) or Class X if the agent is appointed in a place with a population less than 5,000 (rural agent).

Under this scenario, a heterogeneous agent profile emerged.

- Students who have passed Class XII or Class X in the age group over 18 years.
- Housewives.
- Individuals with High Net Worth (Those who want to take advantage of high volume policy commissions from their own family business).
- Full-time agents for whom the agency commission is the only means of living.

Irrespective of the age, experience, industry knowledge and so on, the industry invited every person to become an agent provided he/she had the requisite educational qualification. Though this gave an employment opportunity to millions of people, the problem of training remained persistent, for the insurance companies wanted quality agents.

The Constraints

a. Heterogeneity: As briefly explained above, the heterogeneous crowd could not fit into any particular learning style. The overwhelming numbers displayed all types of learning styles – structured and unstructured, with different combination of learner types viz., auditory, visual and kinaesthetic learners. The one-type-fit-all solution is next to impossible in such a case.

b. Lack of Absorption Capability: Those who have just passed Class X or XII may not have much exposure in the subject of insurance. They find it difficult to understand the concepts, which are complex in nature.

c. Paucity of Time: Time is a major constraint for both the housewives and individuals with High Net Worth. The syllabus for the training is very elaborate and requires continuous learning and understanding.

d. Lack of Infrastructure: The sudden spurt of demand for agents’ training outperformed the supply side. The existing infrastructure could not accommodate the large numbers. Though almost all insurance companies preferred the offline classroom training, they could no longer cater to the numbers. And, thus emerged the online training institutes in the year 2003.

e. Lack of Bandwidth: When the online training was first introduced, the industry faced another problem. Internet was available only in big cities. Even there, the bandwidth was very low and cost was high. Due to this problem, any training material provided online could not follow the established norms related to engaging the learners. The courses had to be flat and devoid of audio, video, animation, learner engagement and so on.

The Problem
The sheer number is the problem. Every year, around 1.4 million candidates from various insurance companies take up the exam conducted by the III. As on March 2008, approximately 10 million people have taken up the exam from the time the regulation was introduced. Faced by a multitude of constraints, the industry could not provide quality education to its agents despite an urge to grab the niche insurance market. This was reflected in the number of persons passing the III exam, an essential and mandatory requirement to get agents license. The exam resulted in a poor 20% to 25% of pass percentage. An offshoot of this poor performance is the increased cost. The training cost ranging between Rs. 1,500 to Rs. 3,000 (USD 30 to USD 60) per person was totally lost on 75 to 80% of the people trained.

Arrangement Between III and Insurance Companies

Considering the cost of training, the constraints faced by the industry and based on representations from the insurance companies, the IRDA and III made certain amendments to the training guidelines in November 2007.

- IRDA reduced the number of training hours as 50 instead of 100.
- III gave a new syllabus and published a question bank containing 500+ multiple choice questions with answers. It agreed that the final exam would have questions drawn from this question bank.

In spite of such relaxation, there has been no significant improvement in the pass percentage. The problem continues even now.

Part 3: The C & K solution to address the training constraints and improve pass percentage is by developing a product that is

delivered innovatively through multiple models.

I-guru Test Bench – A Product from the C & K Management Ltd.

Objective
To provide a high-impact, cost-effective tool that will help insurance companies improve the number of persons passing the exam conducted by Insurance Institute of India (III).

The Issue
Every year, around 1.4 million candidates from various insurance companies take up the exam conducted by the Insurance Institute of India (III). The pass percentage ranges between 20% and 25% on an average. Insurance companies and III have agreed that the exam questions will be on the model (often, the same) questions as given in IC 33 Book, which contains 500+ questions and answers.

Though the question bank is available in public domain, a large number of learners fail to understand the material and retain answers. The reasons for this are many; the key ones being that they are not motivated enough to learn, find it boring to memorise the material and, except for a few topics, explanatory content and examples for the questions are not available in IC 33 Book.

The Need
The need is for a simple explanatory answer for all III questions, which are easily understood and retained by the candidates so that they can pass the exam. The tool should aid quick learning without taxing much energy and taking the time of the learner. It should be in an interesting format so that people with different learning styles are engaged. It is also required that the tool be in electronic format to enable distribution across India.

I-guru
“I-guru” is an IRDA approved online training portal that provides training to thousands of candidates from many insurance companies pan-India. I-guru is sponsored by C & K Management Ltd., which is one of the leading e-Learning solution providers to Corporates and Institutions in India, the Middle East and the UK. Considering the needs of the insurance industry and based on the experience of providing online training to thousands of candidates for the past four years, C & K has come out with a tool that will aid the companies in improving the pass percentage of candidates appearing for the III exam.

Adult Learning and Learner Profile
The developers have taken into account the two main requirements for the success of any e-learning initiative.

1. Adult learning principles
2. Learner profile vis-à-vis styles of learning

Adult learning principles: Research shows adults learn best when it is unstructured and when they are given the option to learn what they want. As adults are mature and have seen, experienced and handled several situations, they prefer learning that connects to real life and their own past experiences. This way, they recall quickly and relate well to fresh inputs, which results in retention of the learning.

Learner profile vis-à-vis styles of learning: When the target audience is large in numbers and spread geographically across the country, it becomes a heterogeneous community. There are students, housewives, high net worth individuals and persons who would like to consider insurance agency as their full-time job. There would be learners with any one or more styles listed below:

a. Read and learn
b. Hear and learn (audio)
c. Do something and learn (kinaesthetic)
d. See and learn (visual)
e. Can learn only when it is structured
f. Can learn unstructured content

The Challenges in Course Content, Design and Delivery
- Content has to be simple, easy to understand
- Design has to satisfy the learning styles of all types of learners
- Delivery of the course has to be effective and efficient

Considering all the above challenges, I-guru came out with a product that satisfies the content, design and delivery needs of the target group.

The Product – I-guru Test Bench
a. I-guru Test Bench is a product that provides explanatory content for every question and answer contained in IC 33 Book. The final product will feature 500+ questions with relevant explanations
b. The content comes with original real-life examples/tables and other appropriate situations
c. The design consists of appropriate visuals/images/animations to enhance learning
d. Professional voice-over is added to all explanatory answers
e. The product has around 18 to 20 hours of e-learning course material

While the interactive content remains the same, the content is presented in three different formats to ensure learner engagement and retention.

1. An Interactive Game (Gold hunt)
2. A Test Bench
3. Chapter-wise/Topic-wise Learning

Play a Game

Why a Game Model
Generally, people connect themselves with play or fun when learning leans toward
boredom or becomes difficult. The young audience comprising the student generation will absorb the content without much difficulty with the use of a game model. The learners are expected to learn with fun and play the game as many times as they want. This ensures an effective learning reinforcement.

The Game

Learners will play a game patterned after maze.

- This will contain roadblocks of 25 gates/obstructions, each representing one question randomly selected from 500+ questions. The learner has to answer all the 25 questions to reach the destination
- A learner will start from the bottom of the maze and reach the destination through a series of roadblocks that would open when he/she answers right. The player collects a gold coin for each right answer
- When the learner answers a question wrong, he will be penalised with the toll charge and the block will open for the next question
- Depending on the final score, he/she will get a medallion or a feedback to learn the answers
- On going through each gate, a link gets established at the bottom with right/wrong answer given by the player. On clicking the link, it opens the relevant screen with a detailed explanatory answer

As described earlier, each answer gives an example/situation, appropriate visuals and voice-over to satisfy the learner’s preference/style of learning. Thus, the learners are able to learn what they want to learn on a selective basis. Some may choose to click only those that they get wrong, while others may choose to go through all the questions. The format blends an element of challenge along with an interesting delivery mode to enthuse a large number of learners to play the game. Some may even re-play the game to see how they fare after revising the learning content. These scores will also inform the learner as well as the insurance company about the learner’s preparedness in fielding a randomised test.
Sample Screen Shot of the Game

Sample content page that would open on clicking the link that gets generated at the bottom of the game screen
Take a Test

Why a Test Bench Model?

Test Bench model gives the option to the learners to attempt a test, assess themselves, and learn where they have gone wrong. Every time they take a test and see improvements in their score they are self-motivated to go further with the questions. With a click of the mouse, the learner is connected to the right answer.

The Test Bench

- Learners can take a test containing 30 questions randomly generated from a question bank of 500+ questions
- Learners may attempt all the questions OR may choose to skip questions to return to answer later on
- At the end of test, learners shall submit the test; on completion of test timing, a forced submission will be done. The score will be displayed
  - The link appearing in the scoreboard for each question will show the right/wrong/skipped questions in colour codes
  - On clicking each link, learners can view explanatory answers, as described in the game above

This format will allow learners who prefer a standard test format to practice. Their performance on this test can help both the learner and the insurance company decide if the learner is fit enough to appear for the test, or if he/she needs to undergo some more training/self-preparation in select chapters, before attempting the test. This will help improve the pass percentage.

Sample Test Screen Page

(574 )
Sample Results Page
Chapter-wise Learning

Why Chapter-wise/Topic-wise Learning?

Since the target audience is not identical with respect to the learning pace and basic knowledge levels, the product is designed with a blend of structured and unstructured learning mechanism. While the Game Model and the Test Bench Model take the learner through an unstructured way, Chapter-wise learning gives the learner the feel of a structured learning. After they learn the chapter, they can visit/re-visit the game and the test bench models to assess themselves.

Learning Objects

The explanatory answers of all chapters of IC 33 are arranged chapter wise
The learner has the option of reading any chapter/topic of his/her choice
Each question with the correct answer makes a learning objective
All learning objectives of each chapter in IC 33 are listed and linked to detailed explanatory answers, which are the same as in the game/test bench.
Sample Chapter-wise Learning Home Page

<table>
<thead>
<tr>
<th>S No</th>
<th>Learning Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Life insurance is a contract within the meaning of the Indian Contracts Act, 1872, enforceable in a court of law.</td>
</tr>
<tr>
<td>02</td>
<td>The principle of utmost good faith is applicable to both life and non-life insurance policies.</td>
</tr>
<tr>
<td>03</td>
<td>The principle of utmost good faith is mainly meant to protect the interest of the community of policyholders.</td>
</tr>
<tr>
<td>04</td>
<td>The principle of utmost good faith ensures equality, no adverse selection and correct premium charges.</td>
</tr>
<tr>
<td>05</td>
<td>The responsibility to comply with the principle of utmost good faith rests with the proposer.</td>
</tr>
<tr>
<td>06</td>
<td>The principle of good faith applies to only those material facts that affect the extent of or exposure to risk. This does not apply to facts of common knowledge or of law and those that are not material for underwriting.</td>
</tr>
<tr>
<td>07</td>
<td>Insurance is only to protect the individuals’ interests. Capacity to contract applies to both the insurer and the insured. The consent to the contract can also be implicit.</td>
</tr>
<tr>
<td>08</td>
<td>The duty of disclosure operates only till the risk commences.</td>
</tr>
</tbody>
</table>
**Final Practice Test**

This section features a mock test of the III. Any learner getting a good score in this final mock test has brighter chances of clearing the final exam of the III. This format will mimic the final test and properly prepare the learners before they actually undergo the final test. Their performance in this test can help both the learner and the insurance company decide if the learner is fit enough to appear for the III test. Maybe some benchmark scores can be maintained to ensure that only such learners are allowed to proceed for the test. This will help reduce costs by ensuring that only the “exam-ready” candidates are sent for the III exam.

**I-guru Test Bench Value Addition**

This product will be useful to all prospective agents, irrespective of the type of training they have undergone viz., offline or online. The product, once installed in the Intranet of the company, will be available to all the staff/allowed users irrespective of the location. The existing agents too can benefit from the product by refreshing themselves. The course can well be upgraded whenever new conditions or issues arise or rules get framed.

The value addition is to give an interface page with a self-registration process. This will mandate a first-time user to register his details with his name/employee code or application number/branch/mail ID and the like. This will facilitate a simple tracking mechanism. The tracking system will record the number of times the learner has played the game, taken the test and the respective scores. In addition, the final mock test scores will also be captured for each candidate. Reports will be available to insurance companies that will help them decide on short listing the candidates for the III test. There will be analytical reports as well to take corrective steps in training as required for specific
branches or categories of learners or training providers.

**Benefits to the Company**

1. Rich learning content that can help improve pass percentages and get agents quicker to the market.
2. Faster time to market with agents better equipped to handle customers by virtue of exposure to real life examples and situations that explain the various concepts and IC 33 questions.
3. Readymade, easy to use tool for refresher training.
4. Multiple training formats in one tool that will cover nearly all type of learners and learner situations.
5. Specific learner tracking enabled to allow companies to check learner performance.
6. Analytical reports to decide action steps for further learner interventions.
7. A one-time, company-wide license to use the content and the tool with unlimited users, which translates to negligible costs per agent.
8. Cost savings in ensuring that agents are “exam-ready” as the money spent on exam fee will not go waste with improved pass percentages.
Conclusion
It is extremely challenging to hook the learners of heterogeneous backgrounds in all respects viz. cultural, social and educational differences. The multiple delivery models offer the freedom of choosing one’s own choice in the learning pattern as suitable to the learner. The approach to the subject has been mainly based on the psychology of learners who would prefer variety in learning.
Reflections on e-Learning 2.0

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Abstract
This paper will discuss the new perspective of e-learning using the e-learning 2.0 technologies which are the inspiration of Web 2.0 technologies. This new generation of e-Learning will change the way of knowledge sharing from top-down to bottom-up learner driven learning. This paper will also discuss the previous generations of e-Learning tools and highlight the latest innovations which include the read/write websites, blogs, video, audio, presentation shares, wikis, etc.

e-Learning 2.0 is relatively new and it would take some time to occupy heights of maturity. This kind of study, it is hoped, would be of great interest to academics and professionals. This paper will also seek to identify the changes that need to be brought about in the role of instructors, instructional designer and other related roles.

Introduction
What is e-Learning

e-Learning, which is also referred to as CBT (Computer-based Training) and TSL (Technology supported education/learning) or simply Electronic Learning has its roots originated from the concept of Distance Learning where the trainers and the learners don’t have to be present physically. This implementation of distance learning is supported by computer technologies and evolves with internet, where the entire training session is delivered without the presence of the instructors or the learners and where the traditional media or channels are replaced by the computer-aided tools and technologies.

Since e-Learning model does not require face to face interaction and presence in the classroom, it provides the opportunities to the companies to train their employees and benefit from e-learning by cutting down the expenses of attending the on-campus trainings and on the other hand provides opportunities to join the trainings and lectures all over the world.

Currently, many universities are offering complete programs online by using the wide spectrum of available technologies. The learners can complete their courses online from end to end i.e. from registration to the final examination and certificates.

History of e-Learning

e-Learning is around us for more than 10 years and has evolved with the advent of World Wide Web (the internet). In the early stages of e-Learning, the training material was distributed in the media which was shipped and the learners retrieve the contents by the computers, this kind of e-learning is also referred to as CBT (computer based trainings)

Later, with the advent of internet and its related technologies the e-learning evolved and brought changes in the delivery model of the courses. This stage of e-Learning was also referred to as e-Learning 1.0. At this stage, computer applications were developed to facilitate the learning environment and for the better management of courses and they were
referred to as Virtual Learning Environments (VLE) or Learning Management Systems (LMS) developed by different companies. Examples are IBM workplace by IBM, Lotus notes, Moodle and many more. These applications are huge and cumbersome computer software and their scope revolves around the courses, testing, timetables etc. These VLEs are currently being employed by many universities for learning, where courses are delivered completely online. Today, these systems are used to deliver the courses online but the way the courses are structured in the still the same traditional way, the only different these technologies has brought is that they have changed the medium or the channel of the course delivery. This approach of learning is driven by the institutional needs rather than the learners.

The New Generation of Learners
Learning is also a social process where it requires interactions and communications, with the advent of new internet technologies learners can interact with each other instantly and very easily. New trend has been noticed of the internet users and it is also referred to as n-gen (net generation) by some bodies. These users acquire knowledge from various resources in the form of images, text, audio and visuals instantly. These users conducts the research and learn the topics very quickly by searching internet resources, reading blogs, articles, posting questions in forums and get instant responses and attend e-Seminars, Events and Conferences to complete their research work. Information availability is too high and collaboration with people around the globe is as quick and easy as click and chat.
This change in learning style is brought with the invention of new internet technologies also referred to as Web 2.0. In the next section some of the key tools and technologies are discussed which are used to support the new generation of e-Learning also referred to as e-Learning 2.0.

e-Learning Tools and Technologies

E-learning tools and technologies can be categorized in to the following.

- **Self Learning**
  This allows the learners to do ‘on demand’ learning, material are available on demand and the learners can start and stop as they want. This is also known as asynchronous learning.

- **Live Learning**
  This allows the learners to do online learning with the help of virtual class rooms, there are many such systems available in the marking namely Horison Wimba, Interwise, Web Ex etc. This mode of learning is also known as synchronous learning.
Within these two groups, there are many tools and technologies available in the domain of Web 2.0. In the following section some of the key technologies are mentioned briefly also indicating the change they have brought in learning styles.

**Blogs**

Blogs are websites maintained by individuals to share their information in the form of regular postings. Blogs can talk about any particular subject, event and even serve as the online diary of the individuals. With the help of blogs people share their experiences which benefits readers in their consumption of knowledge. Blogs also support comments which allow the readers to post their feedback. There are many free services available in the internet which allows creating personal blogs in seconds and free of cost like blogger.com, wordpress.com etc.
In the context of learning, the instructors and the learners can create their blogs to share their ideas on a particular subject and enhance
their knowledge by reading and commenting others blogs.

**Webcast, Podcast, Vodcast**

Webcasts are the audio or video contents streamed over the internet. They can be broadcasted live or on demand. There is plethora of online webcast available in different topic either free or at cost. Podcast is an audio file available in the internet for download; these files are shared through RSS feeds (sharing technology and is discussed later in this paper) applications like iTunes or iPodder are used to download these files with the subscription to the podcast feeds. Vodcast is same but the media transmitted is in the form of video. Today, you can find all news paper sites supporting Podcast and Vodcast through their websites. In the context of learning, the subject can be discussed and delivered by the instructor in the form of podcast and the learners can subscribe to the podcast feeds and listen to the contents as soon as they are available.

**Digital Storytelling**

Digital storytelling is the way to tell the stories using computer based tools. Web 2.0 technologies are used to deliver the digital storytelling as they normally involve video supported by a mixture of text pages, images, audio etc. In the context of learning, the subject can be delivered in the form of storytelling which allows the learners to absorb the concept easily and on demand.

**e-Portfolios ?**

Electronic portfolio, also known as e-portfolios, digital portfolios or web folios is a collection of information related to individual’s development, progress, achievement. E-Portfolios can include wide rand of information about the individual including: Personal information, educational history, professional history, research work, personal values and interest. In context of learning, learners can benefit from e-portfolios by managing their personal knowledge, history of development and growth, planning and goals. Instructors can also benefit by creating learners for lifelong learning and doing more authentic assessment.

**Wiki ?**

Wiki is a page or collection of pages that allows everyone to add new and edit contents; they are used to create collaborative websites. Two good examples are Wikipedia and Wikimapia. In the context of learning, Wikis can be used by the instructors and by the learners. Instructors can use wiki to design curriculum, lessons and assignments. Group of instructors can use wiki to collaboratively develop course materials. Learners can benefit from wiki by creating group assignment, research on a particular topic and expanding ideas.

**Collaborative Bookmarking**

Collaborative bookmarking is the method of managing and searching bookmarks of the web pages with the help of metadata like keywords and tags. As a step towards maturity in collaborative bookmarking services delicious, stumble upon, reddit and digg also provides comments and ratings on the bookmarks. In the context of learning, the instructors can share the resources available on internet related to the subject by bookmarking them for learners, while doing research the learners can also grow the list of bookmarks by marking related resources which benefits the entire group.

**Web Feeds**

Web feeds is a data format of the frequently updated contents in the internet, the content publisher syndicate the web feeds and allows
the readers to subscribe to it and receive the summary of the updates. The method of grouping the feeds together is called aggregation.

Today, almost all the news media uses feeds to publish the contents which are consumed by the readers using the specialized software. There are many sites available like feeds4all who aggregates the feeds in categories and provides a huge list of feeds to subscribe. The famous technologies available today as part of the family of web feeds are RSS (Really Simple Syndication or Rich Site Summary) and Atom.

In the context of learning, the instructors can update the learners on the frequently updated contents through RSS feeds. Many learner portals and sites share the summary of news, announcement and events by syndicating the information for them through RSS.

**Social Network Services**

Social network services can be defined as a platform to facilitate the creation of online communities of the people having mutual interest or related to the contents related to a particular subject. All the above mentioned technologies can be offered through the social networking sites.

Social networking services can be divided into the following types:

- **Profile based social networking services**
  Face book, my spaces, linked in and Bebo are some of the examples of profile based networking sites, where people sharing a similar profile create their communities and collaborate with each other.

- **Content based social networking services**
  In this type of social networking services the profiles does exists but they play a secondary role in bringing up the communities, and the contents takes up the primary role to bring people together and form communities, the famous examples of content based networking services are flicker, YouTube and metacafe. Shelfari is another social network community of the people who loves books, it allows creating virtual shelf to show off the books and see what your other friends are reading.

- **Mobile social networking services**
  My Spaces and Twitter offers the community building in mobile phones and related technologies. They allow people to communicate each other using their mobile devices which make it very easy and quick to communicate.

Group based communities like yahoo groups and virtual environment communities like second life are also very popular where people interact with each other to generate ideas and information.

In the context of learning, the instructors can select the right social networking services to collaborate with their learners and share and discuss the subjects. Social networking sites are good candidates of being a central hub of all the learner activities.

**Other Tools**

There are Search services available to search the right content for you, various delivery and assessment tools are available namely slideshare, survey monkey etc. There is lot of research work and development going on to improve the learning model using the new web technologies and in future we will see more and more new learning technologies and enhancements in the existing ones.
Conclusion

As discussed in the paper, the platform and technologies are ready and it is the right time to bring a change in the learning model. Although the VLEs that we have today are learner centric but the control of the information flow is mainly from the institution; learners receive the information in the fashion it is delivered by the institution. The instructors should place emphasis on learners’ collaboration and take initiatives in utilizing these tools to facilitate the flow of communication among learners.
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English Language: Issues with Internationalization and Localization of e-Learning

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Abstract
e-learning modules, lingual barriers, challenges in effective communication, learner motivation, culture, English language, International, Local, reducing gap in e-learning, language and e-learning

Not only does the English Language borrow words from other languages, it sometimes chases them down dark alleys, hits them over the head, and goes through their pockets. — Eddy Peters

Shift in the Teaching of English as a Language

Technological innovations have given a boost to the growth of English in recent times. English, as a language, has the largest reach to the global audience now in this era when aided by science and technology, more than anywhere in the past. Further, English is fast manipulating many other languages chiefly due to the Internet and media. This growth in the field of knowledge acquisition and distribution has tremendous implication for e-learning everywhere, especially in the non-English speaking cultures. Numerous additions of English terms to other languages have helped in the proliferation of the language across borders. Apart from these, it is now essential to master the language to utilise the resources available in the Internet and take part in the "global classroom" as a teacher or student. e-learning is seen to be contributing towards many of these changes with rapid interactions and ideas, now found to be more compact with information and knowledge. In the same tone, the growth of the Internet has been one of the prime facilitators behind the spread of English language. These technology-aided upsurges have taken place at a time when computers are not looked upon something that belongs to the exclusive domain of a select few, but are widely available to countless individuals across nations and boundaries. Concurrently, these changes have also been continuously changing our traditional means of communication, work-habits and ways of trade, entertainment and learning. These have also led to unusual conflicts between local identities and global associations. To this extent, the internet could be cited as a contributory factor behind the shift from a communicative approach towards a context-based approach in the teaching of the English language.

A change of this nature puts forward several issues related to ELT and one can argue that it necessitates a reconsideration of the traditional definitions related to the nature, scope and constitution of the English language. This, at the same time, dictates a move away from the recognised EFL/ESL classifications and leads one toward a less culturally loaded outlook of English as an international language (EIL).

The Internet and English
The Internet has revolutionized the way people correspond today. Apart from making the world ‘border-less’ by its reach across nations and cultures, it has facilitated in creating international communities in several ways, especially by means of social networking sites, blogs, online forums, ‘chat rooms’, etc. These play a major role in knowledge dispersal and knowledge creation. The virtual environment facilitates people communicate and express ideas that get established or refuted within hours across the world. This also helps people exchange ideas that are local and disperse the same in a global environment. At this juncture, it has become more likely for one to encounter globalised versions of many local ideas and vice versa. Ideas are now no longer limited to a single individual, a nation or a community. This is true for languages as well. One can find several versions of the same language being used in the internet. Since people across the globe rely on English heavily as a medium of communication, it has been affected by its extensive usage. E-learning or web-based learning count on technologies like Web 2.0 on one hand and the English language on the other. It is thus unavoidable to avert changes that influence e-learning by means of these factors. At the same time, changes affecting the English language through web-based learning are also inevitable.

The Internet is changing English as a language, partially due to the fact that it gives rise to new vocabulary, but more prominently because the internet as a medium and its users impel the language to take certain directions. Verbs like boot, email, chat, text, surf, bookmark, e-shop, and many more like these demonstrate the impact of internet on vocabulary. A few years back, each one of these either suggested different ideas, or were not thought of altogether. Essentially, the Internet has become a major cause behind language change. With changing times, concepts like a 'Netspeak' (a language variant) and a 'Netiquette' (conventions surrounding its use) seem to rise and mature. This shift in the language is evolving very fast and lacks an extensive history to notify syllabus designers and ELT practitioners. In most cases, emails neither possess, nor need to follow punctuation conventions. Typos and spelling mistakes are seen as something common depending on situation and more or less tolerable with this medium.

Here is an example that illustrates the idea. Can you read the following?

Aocdrdnig to rscheearch at an Elingsh unervtisy, it deosn't mttar in waht oredr the ltteers in a wrod are, olny taht the frist and lsat ltteeres are at the rghit pclae. The rset can be a toatl mses and you can still raed it wouthit a porbelm. Tihs is bcuseae we do not raed ervy lteter by ilstef, but the wrod as a wlohe.

The above sentences were passed across the Internet as a test to judge whether people are comfortable reading wrongly spelt sentences and make meaning out of them. Interestingly, most of us could read the words and derive some kind of meaning. This is because we now tend to read words by their structures more than any other time in the past.

**Do Words Convey the Right Meaning?**

The important question that one should be asking here is to what extent should this be allowed to influence the language content during this era of knowledge shift, through tools like emails? Moreover, synchronous emails, witnessed in real time chat forums (e.g. gmail, rediff, yahoo, etc), represent a kind of exclusive text version of spoken English that is unrecognisable at times. The language that is created from such kind of conversations, mostly through sources like text messaging on mobile phones, is found to be absolutely dissimilar to anything else
known to us. Take for example expressions like "c u l8r m8" for "see you later mate" and "wn cn u km" for "when can you come", which could be revealing. It becomes impossible at times to comprehend these ‘conversations’ and recognise them as ‘sounds’ of the English language.

The Internet, thus, is clearly marking a shift in our understanding of English and what constitutes language. It is also clear that this swift and largely unfamiliar development within the language is definitely set to continue unabated. We may have our own reasons to like or despise it. However, this will continue to grow. The pertinent questions that seem to be knocking at the doorstep seem to ask whether this variety (Netspeak and Netiquette) have to be included in classroom practice in the near future or we would be able to avoid their inclusion in the mainstream text.

**English and its Assorted Users**

For people whose native language is neither English, nor any of its variants, are exposed to the language as a foreign tongue, primarily through intermediaries like internet. Their unfamiliarity with the language leads them to use a simplified variant that excludes a host of idioms found in British English, American English, Australian English, etc. The dissimilar background of the users actually helps promote different versions of the language. The understanding of the language is so varied that at times they make mistakes, and sometimes the ‘English’ is so different on the Internet that it is almost incomprehensible to others who do not share a similar variety or usage. Apart from this, non-native speakers of English having comparatively less exposure to the language often fail to spell difficult words, mostly due to their familiarity with English as a spoken language.

According to Graddol’s study (2000), the year 2000 witnessed about a billion English learners. However, the study says that a decade later, the numbers will be double. The estimate foretells a heave in English learning, to attain its peak in 2010. It also specifies that over 80% of information present in the Internet is in English. The fact that the English language has seen the presence of more non native speakers than the natives around the world has broken all records in history. This seems to be complemented by the diversity of context with respect to the learners' age, nationality, learning background and so on.

**Use and Abuse of English**

Unlike earlier times, dictionaries of contemporary English normally document the language according to its current usage. However, with the frequent drift in the usage and shifting of directions, the distinction between ‘right’ and ‘wrong’ words/expressions/usage becomes difficult to establish with absolute authority. The absence of a watchdog to monitor the usage of the language seems to have added to the grief of English, since unlike French that is guarded by the rules of the Académie française, English seems to tolerate a number of alternative spellings. These alternatives come into play based on different patterns of word formation and several other variations.

One should neither take the internet as the source of all wisdom and knowledge, nor as an absolute productive medium that has given a free rein to bloggers to operate without restraint. This free rein has tinkered with numerous English terms and usages in innumerable ways. For example, several ancient English cliches and expressions are being distorted by the widespread practice of cut and paste and the wide circulation of unrestrained writing on the internet. Here is how The Language Log comments on the rampant practice of playing with English usage:

According to the Oxford English Corpus, a database of a billion words, dozens of
traditional phrases are now more commonly misspelled than rendered correctly in written English.

"Straight-laced" is used 66% of the time even though it should be written "strait-laced", according to lexicographers working for Oxford Dictionaries, who record the way English is spoken and written by monitoring books, television, radio and newspapers and, increasingly, websites and blogs.

"Just desserts" is used 58% of the time instead of the correct spelling, "just deserts" (desert is a variation of deserve), while 59% of all written examples of the phrase in the Corpus call it a "font of knowledge or wisdom" when it should be "fount".

It has become so widely used that the wrong version is now included in Oxford dictionaries alongside the right one.

Other mistakes fast becoming the received spelling include substituting "free reign" for the correct phrase, "free rein".

The original refers to letting a horse loose, but many use "reign" and assume the expression means to allow a free rule.

"We have to accept spelling is not fixed and can change over the years," said Catherine Soanes, of Oxford Dictionaries. "You only have to look back 100 years, when the word rhyme was spelled rime. But since then we adopted rhyme as the correct spelling because this is more like the Greek word from which it originally came."

She added: "Our Corpus has around 150m words from the web and the way words are written often has to do with familiarity.

"For instance, 35% of people say 'a shoe-in' when actually it should be 'a shoo-in'.

"But the original is an American phrase using a US version of the word "shoe" in the first place."

According to the Corpus, another linguistic trend is the American habit of turning two words into one, such as someday, anymore and underway.

The Corpus also records how some words are used almost exclusively to apply to men and others to women.

The Lost Charm of Reading

While we are looking at the internet as a resource, let me put a question here, “Are we losing the charm of reading?” Is the current habit of reading via the web media spoiling our inclination towards reading books? Has the web seriously obstructed and jeopardised our earlier practices? And, the most important question above all these, are we losing patience and concentration while trying to read between lines?

Since the past few years, the web has been tinkering with people's minds and thoughts. This is true in the sense that the internet, since quite some time now, been regulating people’s behaviour, study habits and dictating terms with regard to their online behavioural practices, so much so that it would not be far-fetched to acknowledge that peoples’ minds have changed. They no longer have the similar study habits that they used to, a decade ago. This change in their reading habits can be strongly felt while thinking of reading books or long articles. An average reader in recent times is more comfortable ‘reading’ content displayed on the internet, rather than delving deep inside the content of books. Thought of as a favourite past-time earlier, books are now taken by many as tools of the bygone era. This attitude has led to other effects like drifting of concentration from the content after a few ‘pages’ of one’s engagement with the subject over internet. People often get restless, lose the idea and start looking at something else to do. The habit of deep reading and reading between the lines, that was natural earlier, has become a struggle for a large number of internet users. Though the benefits of immediate access to huge repositories of information and knowledge are many, they come with a price. This is implicit from the fact that the internet
and the media are not just passive channels of information. They not only contribute immensely toward our thought processes, they also shape our thinking. Many people now opine that their minds are so modulated that they seem to take in information the way the Net distributes it.

**e-Learning and its Usage**

e-Learning programmes have been effective across the globe due to their affability, learner satisfaction, and learning resources. While one cannot undermine the vital role played by technology in e-learning, the importance of the effectiveness of language and communication cannot also be rooted out. One of the major challenges for the Instructional writer in an e-Learning course is to understand the nuances of an alien culture; convey the right sense using the accurate words and speak in terms of the learner. With the advent of technology-led and boundary-less learning environment, it is now important to communicate effectively across cultures using learning modules to address learners of all ages and nationalities, and yet be understood internationally, meeting the expected standards. This gains more significance in the wake of our regional, national and lingual differences and becomes more difficult due to the cross-cultural differences in opinions about the language. It is indeed interesting to try to look at the causes behind such differences and the effective ways in which these could be rooted out to help evolve an incorporated system to suit the learning environment better.

**Globalising and Localising e-Learning**

A large number of e-learning companies across the globe in various countries are under the pressure of continuously tackling the challenge of localising e-learning effectively and efficiently to produce materials that are culture specific and still have an international appeal. To make the two ends meet, they confront the task of training staff in the region. To this end, it has been observed that the traditional training sessions that resemble classroom teaching, often fail to serve the purpose effectively. The only solution to this kind of a fix lies in localising e-learning to meet the set standards.

Localisation is often seen as a simple answer to many issues that include complex culture-specific communication, which produces ‘global’ ideas and ‘norms’. Some other factors could as well be seen as instrumental in success in global communication that may influence those at the receiving end of those ideas. These factors would include one’s ability to relate to the similar things being done differently, culture sensitivities and work ethics. Thus, while the projected e-learning models have to be country-specific, they are also to follow certain set norms, recognisable worldwide, across cultures. To cater to these ideas, there are style guides to determine the acceptability of ideas according to specific cultures.

**Components of Localisation**

Localisation is just not about translating e-learning content. Translation is just one aspect of the whole thing. It has many more facets related that are necessary to make the process a success. Apart from linguistic adaptation, there are two other types of adaptations (cultural and substantive) that are necessary for its proper progression. Thus, while linguistic translation is an essential element involved in the practice of localisation and re-engineers the processes associated with principal linguistic functionality, substantive adaptation includes transforming the essence of the content for the specific/target audience and cultural adaptation consists of providing a proper background with the thorough understanding of the cultural nuances of the target audience. Looking at a specific culture might also call
for a proper perception of the traditions, involving, but not limited to, contextualising the content and re-phrasing ideas to suit the immediate and anticipated necessities.

Implementing Strategies

Today, the world seems to push us to think globally and act locally, interpret and analyse international strategies, condition them according to local situations and adopt implementation strategies that fit the target audience. Misunderstanding, it seems, comes very easily when you are trying to communicate with someone of whose behaviour, culture and personality you are hardly aware of. Especially, while preparing a course on e-learning, one has to be aware of certain key-cultural issues/norms that could affect the person taking the course. This becomes even more important due to the fact that the instructor and learner have hardly the chance to know each other, except through the common media, that is, the web. In the wake of this fact, it becomes crucial that the instructor is aware of misconceptions or misunderstandings that could affect the reader negatively. This becomes even more important since a single instance of misunderstanding could permanently bias the reader against the course and all subsequent courses. In an environment that is culturally different for either communicator, it is important that the instructor takes the pain to appreciate and understand the nuances of the business in the prism of the learner’s culture. An instructor is often expected to ‘unlearn’ a few things and re-learn a few more to work globally and cater to an international audience.

The idea of relying on one’s own culture while instructing learners belonging to another could actually prove quite dangerous at times. The instructor and the learner could be so different geographically and culturally that ideas and cultural-symbols could have opposite meanings for either. In such situations, it is important to band together facts to reach a solution viable for both. Also, there are certain ideas and norms that are generic. All these together determine the content of the learning materials. While localisation is a burning issue across organisations, it is itself determined and affected by the several lingual dialects that exist. Apart from that, there are other issues like dialect, vernacular and idiolect that establish rules and verify the acceptability or otherwise of usage, nuances, customs and traditions. Since personal histories, countries of origin and upbringing influence one’s worldview; an individual’s language may not contain words and concepts that someone else’s does. So, cross cultural misunderstandings are bound to happen. People are thus vulnerable to interpret messages and views differently than are conveyed.

A Probable Solution

To resolve these issues, it is essential that there exist a positive mechanism to convey the right sense. It is a common fact that globalisation has been primarily driven by Information and communication technologies (ICT). Enabling of speedy contacts across nations must be accompanied by comprehensible messages to the receiver – message that is legible, without being contentious and controversial. Thus, the need for a global language, loaded with the features of flexibility and elasticity, capable of, and encouraging modifications in the lexicon and usage is apparent. English is the one language encumbered with and still supporting these cross-cultural modifications and at the same time, increasingly affecting other languages as well. As a result, new hybrid languages have emerged in the past few years – like Spanglish, Denglish, Franglais and Swenglish.

Apart from the above, situational contexts also influence the way we perceive language.
The listener’s recent experiences as well as environmental factors influence the way the individual perceives messages directed towards him/her. Contrasting emotions, situational context entails elements external to the listener. This includes the way the message is presented. Thus, our previous utterance and its perceived meaning will definitely have a say over listener’s perception of our next utterance. Apart from the above; environment also plays an important role in one’s perception of ideas. For example, a noisy, dark, cold, or uncomfortable environment is bound to distract the listener’s attention. Also, one’s personal beliefs too play a vital role in filtering everything that one hears or listens, while people tend to relate everything they experience to previous knowledge. They have core beliefs about things going around them. These personal maps direct the way people respond, recognise, and interpret what they hear. These messages are influenced considerably by the listener’s personal beliefs. Thus, it is necessary that the presenter/narrator select words carefully, and design presentations accordingly to touch listeners on a deeper emotional level. It is because at this deeper emotional level most effective communication can be achieved. In e-learning, it is significant that the target audience is identified to facilitate the designing of effective courses, through the appropriate use of language. This effective designing call for the need of style guides or style manuals, which could provide a set of standards, not only for content creation and designing of materials as per the requirement of a particular audience and accommodate specific needs-based adjustments, but provide instructions and specifications for generalised use for a wider sharing. Style guides should be flexible enough to accommodate changes as per need and firm enough to be able to guide during controversy.
Conclusion
In the wake of the many controversies regarding the globalisation of English and the issues related to it, one can argue that the process of internationalisation cannot be stopped at this stage. However, at an individual and organisational level, there should be certain norms to regulate the acceptability of usage. While in the e-learning industry this is regulated by carefully built style guides, we still need a body that could monitor the language to impede it from becoming utterly illegible to a person from another culture. The irony stands that while trying to be global, actually we are unknowingly segregating the language as per our specificities. This has created so many versions of the language that one day one version could as well be mistaken for another language altogether.
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Connected Information Clouds and Learning: Informal and Formal

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Abstract

Using Web 2.0 tools, learners and professionals today possess the ability to always remain connected to the cloud and interact with others. As such, learners, to a large extent, and training professionals, to an extent, are increasingly realising how the World Wide Web can be turned into a global platform to effectively harness the available collective intelligence online. The web is making a difference in the way we learn formally in the traditional institutions of education and informally on our own in a digital, networked world. This paper ponders on the potential character and the direction of change the web ushers in, apart from the challenges it brings forth for learners, educational institutions and organisations respectively.

Keywords: e-Learning trends, Cloud computing, Web 2.0, Formal learning, Informal learning, informal learning within formal programmes in further education, informal and formal workplace learning, Read/Write Web, Collective intelligence.

Introduction

With the advent of the World Wide Web, the pace of change has been gathering speed. A few hundred years ago, our body of knowledge used to double at a leisurely pace of hundreds of years. With the advent of printing, this knowledge started accelerating to an average of doubling once in every century. Today, with the web, our body of knowledge doubles every few years. And, virtually, every subject on the earth can be searched about with tools like Google, can be downloaded, and used.

Today, learners, to a large extent, and training professionals, to a certain extent, are increasingly realising how the World Wide Web can be turned into a global platform to effectively connect to and harness the available collective intelligence online. This connectivity and capability to interact with others online with social software is increasingly being referred to as Web 2.0. And, now, Cloud Computing seems to be the buzzword of the moment. So, what is cloud computing?

Cloud Computing

It refers to the invisible "cloud" of distributed data and applications available anywhere, anytime. That means you can distribute your files away from your desktop and/or access programs and services across the Internet using large networks of remote servers. Web-enabled wireless devices are the most pervasive in terms of accessing this ever-growing cloud of information that is ubiquitous by its own nature.

In current times, we are in a constant flux, always changing in the ways we work, adapting to the environment, even while the nature of our knowledge and ideas evolves, and affects the very nature of ourselves. In this technology enabled world, buzzwords such as connected clouds sometimes capture the heterogeneous fluid form of the change and dynamism we are in, with ample capacity for expansion and reorganisation.
The increased ability of the Web, which is being interchangeably referred to as Web 2.0 or the Read/Write Web, has led to proliferation of social software tools such as Blogs, Wikis, RSS feeds, Podcasting, Video casting and Social Book Marking. Along with increased-bandwidth, and wireless connectivity on the go, the web now is made accessible, anytime anywhere on mobile devices too, have supported the evolution of whole new communities, creating a major impact on how we learn. It is making a difference in the way we learn formally in traditional institutions of education and informally, on our own, in a digital, networked world. In sum, as our environment is becoming more flexible and unpredictable, so is our learning. We need to see beyond the cliché of cloud computing and carefully ponder on the truth behind it. Only then can we appreciate the potential character and direction of the change the Web 2.0 is ushering in, and the challenges it brings forth for learners, education institutions and organisations respectively.

Formal and Informal Learning

Formal learning is a planned learning that is derived from activities within a structured setting. Learning typically provided by education or training institutions is structured in terms of learning objectives, duration, content, method and assessment, leading to a certification.

Informal learning is hard to define… you may just call it “non-formal learning”, which means learning outside school, outside formal structures. Informal learning is something that is more social and involves informal interactions with people. It is more learner driven and not instructor driven. Significantly, if we attempt to support informal learning, it easily turns into formal learning.

With the arrival of Read/Write Web, the World Wide Web seems to support informal learning to a large extent. The social software web supports informal interactions, blogs become a means for reflective practice and wikis ensemble these reflections into a collective act. This seems to help build new knowledge, new perspective, new understanding and new ideas for the learner. Smart phones users seem to be always on, always connected to their data on the cloud, without requiring to be near neither their systems, nor having to carry bulky laptops with them.

Informal and Formal Learning in Action

The multiple devices that we posses provide us connectivity to the web at all times. With this, we are shifting away from our reliance on one or two devices to hold our information. Our focus is now on what devices give us easiest access to what information on the Web.

For example, think about the last time you needed to answer a question… say the name of the President of the United States during 1985. Or, how to touch-up a photo that was taken in low light. Where did you look for an answer?

I'm sure you didn’t think: “Well, I don’t know who the president was. So I better go and enrol in a history class to find out! Or, join a class to learn photo printing process techniques.” No, you probably used Google to search for the information and presto you could even correct your photo online for free, without having to have any photo re-touching software in your own systems. That is informal learning!

But then think about it. When you looked for who the President was or how to do a photo retouch, you were searching for small details that were useful.

Now, at formal training sessions, others have already done this research for us. And they have weeded out the nonsense. We are told what to do and what is important. When we learn new things via Google, blogs, forums
and wikis, we must sift through piles of information to find that one useful nugget we were looking for. Many a times, it works, and, at times, we are not really sure. It is great to compile informal learning as long as the sources are trustworthy and the assertions double-checked (particularly when the cost of using incorrect information is high).

Cloud-based informal learning needs to be filtered before one can really learn from it. It is useful if we have the time, are self-motivated, are familiar with the information, have the resources and the inclination, apart from the critical thinking skills to go through all that with a fine-tooth comb.

On the other hand, most of us benefit more from a formal environment where we are taught by a trusted source. Because, as average students, most of us may not be self-motivated and or do not have the time. Of course, it does not mean that all trusted sources are trustworthy!

The Background for the Discussion on the Formal and Informal Learning

Therein lies the problem. Most of this new innovation is coming from the bottom up – the learner, instead of top down – from the institution. There are instructors who use these kinds of social and informal learning methods. But academia, as a whole, has very little research done and there are hardly any metrics about the investment and efficacy of formal versus informal learning that would substantiate its utility as to how that would impact training strategies. And so academia has neither fully embraced this kind of informal learning, nor values it in its assessments.

The use of expressions such as informal and formal learning have a reasonably long history that is much older than the World Wide Web. Then the discussions used to center around the mutually exclusive claims about the inbuilt superiority of one or the other and focused primarily upon formal learning. The Web 2.0 has brought informal learning back into focus once again. While learners are developing skills that are useful in wider social networks on their own due to various reasons the academia, and business organisations, to a large extent, are wasting opportunities by not engaging these tools. E-Learning tools developers are catching up by starting to offer social networking options. For example Saba’s LMS now has the software to socially connect the learners and share their experiences.

Mike Bogle resonates with these thoughts when he writes: “While institutions continue to rely on huge, monolithic systems that inhibit user freedoms and personal ownership, free and publicly available tools like wikis, blogs, social networking sites, instant messaging clients, video sharing sites, web conferencing tools and virtual environments facilitate immediate access to peers in extraordinarily flexible and in customisable ways. It is little wonder then that shadow systems of learning and interacting have begun to develop outside of recognised institutional channels.”

He further elaborates on the topic by writing about the implications for institutions. “To ignore this reality is to ignore learning opportunities for students and ourselves. Regardless of whether these shadow activities conform to formal institutional web standards, it is undeniable that conversations occurring in the Read-Write Web are real. They are having a real impact, have a real audience, and convey real perceptions on both learning and student/staff attitudes about the institution.”

Jay Cross of Internet Time Group wants to create a new learning and development future with his prediction when he says “Wrenching changes in business and society accompanying the global transition from the industrial age to the network economy will kill off much of the training and education
programs as we have known it. In its place will arise a more natural approach to learning through collaboration and sharing. There are great times ahead, an era of fulfilling, bounteous learning unprecedented in human history. However, the journey to this Promised Land will be brutal and unforgiving for people and organizations that resist change and lobby for "back to the basics." But Jay Cross also agrees in his Internet time group’s blog elsewhere that other means of learning will have its place alongside informal learning.

As informal learning on the web is user driven it may not go into obscurity like other latest technology fads that disappear into obscurity with the arrival of the next one.

**The Training Issue**

Formal and informal aspects are constantly, or just about always, there in any learning circumstances, regardless of its size. The decision as to how we learn is mainly determined by the complex social and economical practices in the society, which combines components that every so often are termed as formal and informal.

Thus, in all or nearly all situations where learning takes place, elements of both formal and informal learning are present. But the most significant issue is not the boundaries between these types of learning, but the interrelationships between dimensions of formality/informality, in particular situations.

Liberal or traditional, Education Institutions are generally considered formal learning environments, with ways of implementing a range of pedagogical methodologies, which make formal learning to happen. But is that all only formal and nothing informal to it? Then there are other brick and mortar spaces and situations with natural conversation and dialogue where in we get opportunities to learn in "informal" ways but we either did or didn't. Is that all only informal and nothing formal about it?

And now with the Web 2.0 with its wikis, blogs and social networks people are trying to figure out how best to utilize them and some experts are also thinking in terms of formalizing the informal learning that can happen on line.

But for the learner it really does not seem to matter whether or not he/she learns formally or informally and in what spaces. Learners have numerous options available to them these days, and many of these are "informal". But most of them probably might want some combination of the two. For them informal also works as well as formal learning for that is how we learnt to eat, walk and talk isn’t it!

And so the most important thing is to understand as to what is the pedagogy that allows one to learn best in either or combinations of those dimensions and implement it.

**The Learning Culture in the Cloud Computing Consumer Space**

At the Web 2.0 Expo 2008 held in San Francisco, Tim O'Reilly, the publisher of the popular "In a Nutshell" computer books series, declared that the Internet is fast becoming "a global platform for everything," and an "amazing tool for harnessing collective intelligence."

Researchers at the Pew Internet & American Life Project say that today, 69 percent of online Americans use Web mail services, store data online or use Google Docs or such word processing applications whose functionality is located on the web. In other words, they already are users of “Cloud computing”. Their photos are on Flicker. They use blogs and twitter to write. Their bookmarks might be on del.icio.us instead of the browser. And, most of them have “hard drive” copies of everything to be safe. But, it seems, they put a fair amount of trust in these services for sharing their information and for learning.
Pew research states the following:

- 51 percent of Internet users cited ease of use and convenience as a major reason to have done a cloud computing activity.
- For 41 percent of cloud computing users, a major reason was being able to access data from whatever computer they were using.
- Ease of sharing information was cited by 39 percent as a major reason they use applications hosted in the cloud, or store their data remotely.

With the Web culture, if we may call it so, many of us are adapting to change and assimilating new behaviours in real time, all the time. Like clouds, the perception of our personality is ever changing for the world. We also are now a collection of several interests, connections and contacts. Our information is changing in real time and is tagged in several ways, and is linked in all directions.

**Clouds Bring a Stormy Weather Too**

Here are some of the problems with "cloud computing":

- Where does the data reside? In your country or somewhere else?
- Whose law applies to the data? Your country’s or some other’s? If you ask five lawyers, chances are you will get five different opinions.
- Although most vendors will not share your data in detail with other users, some reserve the right to use your data for other purposes.
- If, for some reason, you decide to change the vendor, how difficult will it be to get your data back or port it to other systems? There is a lot of service lock-in. For example, how you can get stuff out of Second Life?

"Cloud computing" and learning informally from the information available online is not perfect. There are concerns that still need answers. But, there are also numerous benefits to it, including anytime, anywhere access to data, collaboration, revisions, automatic updates, spam filtering and many more.

**The Learner Point of View**

Computers and other devices, with connectivity to the Read/Write Web, provide a means to an intellectual laboratory to experiment with powerful ideas. When you are connecting to the cloud with any of the gadgets, it is becoming a vehicle for self-expression that allows learners to construct knowledge in domains and ways otherwise was not possible a few years back. Using the web makes one feel “more able” as one now has access to a collective form of intelligence. And, with the social media to back it up, one has the opportunity to interact with a feeling of being part of a peer group on the web.

**The Educator Point of View**

When we talk about “informal learning,” “social media” and connected clouds, what this means to us as educators is not clear. The fact is that formal and informal learning are
two sides of the same coin, different aspects of the same thing. They can be viewed and discussed separately, but they cannot be separated. The idea of formal and informal learning is as old as the hills; the only new part is the process as to how it happens. Now with technology one can sit in the comfort of office/home, with a cup of coffee and have access to all the information at their finger tips. When it comes to how people are using the online tools in relation to the training function, there is insufficient or no data at all. Several of these tools were created for some other commercial purpose. So, there is no discussion about the design of these tools in relation to the training function.

With technology and the users themselves inclined towards it, informal learning is becoming an important part of the learning landscape to be left to chance. The approach towards Informal learning should be towards very little control or no control from learning and development departments. Supporting informal learning is like letting a baby take the first steps on its own, but being their always to oversee that nothing untoward happens while doing so. Academia should monitor as to how they can take it on board, give direction and see which elements prove popular and successful in enhancing the learning as such.

**How to Support Informal Learning?**

- Accept informal learning by formalizing its place in the Learning and Development strategy.
- Build a collaborative culture and infrastructure for it to flourish.
- Do not try to manage it. Examine innovative ways of tracking the learning rather than try and fit it into formal processes.
- Observe as to what type of informal learning proves to be effective.
- Understand as to what is the pedagogy that allows one to learn best in either or combinations of formal and informal dimensions and implement it.
Conclusion
The future is here and now. Predicting where this shift is taking us in terms of education in formal and informal settings is difficult to predict in the long run. This is a user driven change we see on the net that is real but there is no real research and valid data available as to its utility and how best and effectively we can use it. Before we fully understand the social implications of the technology and the users’ behaviour, it would have already moved on to the next level. There will be no mysterious element in this continuous chain of change that can put everything back in its original order again. Like the one billion web users, institutions of higher education can also only prepare for change by planning and by embracing change itself.
References

Read Futurelab report in Digital Natives for list of examples


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Mike Bogle on his blog http://techticker.net in an article titled Castles in the Cloud

Jay Cross, Internet Time Group LLC, USA in Predictions for 2009 article by By Lisa Neal Gaultieri, Editor-in-Chief, eLearn Magazine

Building up e-Learning Professionals: The ITI Experience

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Ministry of Communications and Information Technology, Egypt

Abstract
Preparing a capacity of qualified cadres who are capable of coping with the adverse effects of the continuous and rapid change in the IT field was, and will always be one of the hottest issues that should be thoroughly investigated. Unfortunately, the traditional training method (Tutor-Led-Training) has become inefficient when dealing with the huge numbers of potential students. Therefore, a number of new delivery methods, e-learning and blended learning, have emerged. Those methods have their own drawbacks and constraints, which differ from one society to another.

The Information Technology Institute (ITI) was established in the year 1993 to meet the high demand on skilled IT professionals; eLearning is one of the latest technological areas that ITI has adopted in order to contribute to the eLearning market capacity building. This paper addresses the ITI experience in:

The ITI Training Model to furnish the e-Learning market with high qualified professionals, trained on the eLearning technologies, e-Content design and development, as well as the Instructional Design techniques, to fulfill the eLearning market needs.

The ITI Model for e-Content design and development.

Keywords: e-Content Design, e-Content development, ADDIE Model, Instructional Design, eLearning curriculum design, training for eLearning, Blended Learning.

Introduction
It is now widely recognized across the education sector, that e-learning will play an increasing role to widen access to learning opportunities and to enhance the quality and flexibility of learning in order to fully maximize the benefits that information communication technologies (ICT) can provide for learners.

The Information Technology Institute (ITI) was established in the year 1993 to meet the high demand on skilled IT professionals. Since this time; ITI was capable of qualifying and enabling the IT society with up to 4800 of distinguished cadres. Keeping the ITI role as a leader and one of the mentors of the latest IT advancements in Egypt and globally. ITI does not only consider monitoring the market needs, but also devotes great efforts towards forecasting the expectations of next decades in the light of the currently technological advancements. eLearning is one of the latest technological areas that ITI has adopted in order to contribute to the IT market capacity building.

Hence eLearning is no longer an emerging technology. As the statistics Prove e-Learning's Continued Growth, The corporate e-learning market generated nearly $23 billion global industry last year. That reflects an annual growth rate of 20 percent; there are now about 130 million online learners across the world, and is on track for a growth rate of more than 50 percent, which will allow it to exceed $58 billion in 2007, according to International Data Corp. (IDC) [1]. Heavily classroom-learning focused players have been
adjusting their strategies and moving quickly into the hot technology-based training market to have a share of the pie.

The Information Technology Institute (ITI) chose to take the lead in eLearning by a program called VITI that started in 1999. Now after 7 years of continuous development, enhancement, market surveying and online teaching, VITI has become a leading project in Egypt and the Middle East, set for spreading IT knowledge, and enhancing the training process with state-of-the-art technologies.

**ITI Model of e-Content Design and Development (ECDD)**

**Motivation**
- Based on a research about the eLearning status in Egypt, the findings were:
  - Lacking of e-Content Design & development standards and methodologies.
  - Lacking of trained people on Instructional Design and instruction technologies.
  - Lacking of training providers in Instruction Design and e-content development in Egypt.

**Strengths**
- The only training provider of eLearning courses in Egypt.
- ITI brand name.
- 10 years of experience in eLearning domain, built a solid base
- Being a non-profit and a governmental organization allows for training for free (even with allowances to trainees) and simplifies any required procedures with another governmental entity.

**Weaknesses**
- Lack of awareness among community (marketing is needed)
- Scarcity of tutors makes it hard to have alternatives, specially for the next intake
- Lack of prerequisite test and screening for the eLearning applicants (intake I&II)

**Opportunities**
- ITI can be the regional training hub on eLearning in Egypt and Arab region
- The possibility of offering tailored training programs to private sector companies
- The possibility of be the only certified institute in the Arab region, in eLearning services from IADL

**Threats**
- The emergence of a world-wide recognized competitor in the field of training on eLearning
- Losing the governmental support

**Vision**
- To be the center of Reference for eLearning in Egypt

**Objectives**
Knowledge Transfer
Teaching for the ITI eLearning Students
Conduct Training session in e-Content Development and Instructional Design for the ITI Teaching staff (SMEs)

Creating the Reference
By developing a generic Model for e-Course development process
The Methodology: Using “ADDIE” Model to create our e-Courses
  • What is ADDIE Model?

The ADDIE model is a systematic instructional design model and generic term of five phases: [Analysis-Design-Development-Implementation-Evaluation]. Each step has an outcome that feeds into the next step in the sequence. There are probably over 100+ different variations of the generic ADDIE model.
FIGURE 2: ADDIE Flowchart

Source “Intugy- Instructional Design Process for Custom Projects”
• ADDIE Process
Simple step methodologies provide an organized design procedure for the use of instructional materials that can facilitate the creation and maintenance of classes and trainings. These methodologies are applicable to current courses, suggesting practices for redesign to infuse your delivery with a new effectiveness and vitality. They may be utilized for incorporating new technology into the creation and delivery of courses. They are also beneficial for the development of courses using alternative delivery methods.

First apply the ADDIE Instructional Design technique methodology: individual steps are to Assess and analyze needs, Design instruction and presentations, Develop materials, Implement activities and courses, and Evaluate participant progress and instructional materials effectiveness.

• The eLearning Team Roles & Responsibilities

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<tr>
<th>Roles</th>
<th>Responsibilities</th>
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<tbody>
<tr>
<td>Project Manager (PM)</td>
<td>Supervises the overall e-learning process, including design, production, delivery, evaluation, budgeting, staffing, and scheduling. Works with coordinators of various e learning teams.</td>
</tr>
<tr>
<td>Instructional Designer (ID)</td>
<td>Provides consultation on instructional strategies and techniques for e-learning contents and resources. Helps select delivery format and assessment strategies for eLearning.</td>
</tr>
<tr>
<td>Multimedia Developer (MMD)</td>
<td>Responsible for creating multimedia learning objects, such as audio, video, 2D/3D animations, simulations, etc.</td>
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<tr>
<td>Content Developer (CD)</td>
<td>Programs e-learning lessons following the storyboard created in the design process.</td>
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<tr>
<td>Graphic Artist (GA)</td>
<td>Uses creativity and style to design graphical images for e-learning lessons.</td>
</tr>
<tr>
<td>Quality Assurance (QA)</td>
<td>Responsible for quality control in e-learning.</td>
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• ITI Model uses the five phases of ADDIE are as follows
### Analysis

We do:
- The business goals you want to achieve
- The material that must be taught
- The learners' current capabilities
- Target Audience
- Learner style and their characteristics
- Learning Outcomes
- Delivery methods and techniques
- Learning assumptions and constraints
- Online pedagogy
- Learning environment
- Interactivity level and requirements
- Time line of the e-course completion

We deliver:
- Learner Entry and Exit profile
- Training Need Analysis (TNA)
- General Objectives
- Test Items
- Time plan
- Budget

Key roles in this phase:
- Project Manager (PM), Subject Matter Expert (SME), Instructional Designer (ID)

### Design

We Do:
- Document the design strategy
- Choose and apply Instructional Strategies according to the intended outcomes
- Design user interface and user experience
- Content organizing and method of presentation to the learners
- Prototype creation

We deliver:
- Detailed Storyboards contains the Instructional Strategies, the content, User interface, user interactivity

Key roles in this phase:
- Project Manager (PM), Subject Matter Expert (SME), Instructional Designer (ID), Graphic Artist (GA)

### Development

We Do:
- Develop content and learning material based on the previous phase (design)
- Developers work to develop and integrate technologies
- Conduct a tabletop review
- Run a pilot

We Deliver
- Content Production (Text)
- Graphic and animation library (Images, Audio, Video, Animation)

Key roles in this phase:
Project Manager (PM), Content Developer (CD), Multimedia Developer (MMD)

**Implementation**

We do:
- The course meets important business goals
- The course covers content that learners need to know
- Materials are delivered or distributed to the student group
- The course reflects the learners existing capabilities

We deliver:
- Documentation and user manual
- Testing cases document
- Running e-Course (WBT)

**Evaluation**

We do:

- This phase consists of: formative and summative evaluation.
  Formative evaluation is present in each stage of the ADDIE process. Summative evaluation consists of tests designed for criterion-related referenced items and providing opportunities for feedback from the users. Revisions are made as necessary.

We deliver:
- Final published e-Course (WBT)
- QA document
- Feedback document to ensure the quality of our e-Course by getting the answers of the following questions:
  - Do learners like the course?
  - Do learners achieve the learning objectives at the end of the course?
  - Do the learners change their behaviors in the workplace?
  - Does the course help the institution achieve its business goals?

Key roles in this phase:
(all the team) Project Manager (PM), Subject Matter Expert (SME), Quality Assurance (QA Testers), Target Learner.

The Output of ITI Model I is e-Courses: Samples as follows
Fig 4: ITI e-Content Design and development course” Text Screen of Storyboarding course”

Fig 5: ITI e-Content Design and development course” Text Screen of e-Content standards”
Fig 6: ITI e-Content Design and development course “Glossary Screen”

Fig 7: ITI e-Content Design and development course “Quiz Screen”
Accreditation
To be the first in the Arab region Getting certified from the IADL (International Association for distance Learning) after creating our solid reference to crown our model of e-Content development by adding the accreditation.

ITI eLearning Training Model: The eLearning Specialists Platform
The output of Model1 is considered an input to this model, where as this model of eLearning training is divided into two major outputs:
- eLearning Curriculum Design
- Training Delivery Techniques

eLearning Curriculum Design
Graduate Profile
The eLearning platform meaningfully integrates: web design, web development, multimedia design, multimedia development, and technology infrastructure with comprehensive knowledge of current and future trends in e-learning, e-content development and instructional design which are the main areas needed in many corporations to compete successfully throughout the e-content development industry.

Graduates Career
They are strongly prepared to have job opportunities as the following roles;
- Instructional Designer
  Capable of innovating media and electronic content to help learners and tutors transfer knowledge most effectively, by determining the current state of learner understanding, defining the end goal of instruction, and creating some media-based intervention to assist in the transition, through student-only, tutor-led or community-based environments.
- E-Content Developer
  Design, develop, and administrate electronic content for e-learning purpose with good understanding of the global standards and message delivering theories and techniques.
- Multimedia Developer
  Design, develop and support multimedia applications using variety of tools such as Adobe Flash, Director, Audition, etc.
- Web Application Developer
  Design, develop, maintain, and support web-based applications with database connectivity that communicates with remote components and XML Web services using Java technologies

Program Categories
Our training program is divided into the following modules which are spread over a three month period for each. The modules are:
A. Foundation Module (IT and eLearning fundamentals)
B. Focus Module (Specialization, eLearning core courses)
C. Performance Module (Project, e-Course)

The Focus Module of the eLearning training program is divided into 5 categories which are spread over a period of eighteen weeks (by average 450 training hour).
- eLearning Concepts
  Explores eLearning concepts featuring and trends, eLearning theories, theories of CBT and WBT, tools and techniques, survey of eLearning applications, and issues relating to the use of LMS & LCMS.
- Multimedia Concept
  Explores multimedia concepts featuring Multimedia hardware and software, tools and techniques, survey of Multimedia applications, and issues relating to the use of digital media.
• eLearning Core courses & Technologies
This module highlights on basic concepts of eLearning Technologies, eLearning Fundamentals, Blooms Taxonomy & Writing objectives, eLearning Framework & Learner Assessment, Rapid Learning and Interactive Learning.

• Programming
This Module will focus on programming concepts, C programming & Object Oriented/C++ and Web Technologies HTML/CSS, as well as different use of web programming applications, analysis & design using UML, designing games & simulations with highly level of interactivity, Java & Advanced Java Programming, XML for eLearning, Java Script, PHP and HCI.

• E-Content Design and Development
This Module introduces the student to Instructional Strategies concepts, Designing Content, Storyboarding, and developing content & interface for eLearning, e-content standards & SCORM, designing assessment techniques, eLearning Management and Leadership and Implementing & Evaluation of eLearning Courseware.

• MM & eLearning Authoring Tools
This module gives the students knowledge of different multimedia designing tools and authoring techniques and technologies, and the use of simulation tools to create and develop e-course (WBT/CBT) project in which interactivity is the focus by using different kind of software for instance: Adobe Flash and Action Script, Director, Adobe Flex, Captivate.

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![Fig 8: ITI eLearning platform “Program Category”](image-url)
## Program of Study

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<th>Fundamentals</th>
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Training Delivery Technique

Methodology: Blended Learning approach

We are applying the blended learning approach to transform the ITI eLearning platform from Tutor Led Training to Blended Training by using online learning delivery method along with face to face method.

Step 1: Planning to the e-Learning Training at ITI
The application of Sakai LMS (Open Source Learning Management System) within the ITI is about realizing its potential to enhance learning and teaching and to maximize the benefits it can bring to students. Using a virtual learning environment such as Sakai can enrich the learning experience of students by enabling you to:

- Make course materials available as and when required and offer students a rich source of online resources. This is
particularly useful for students who may not be able to get to ITI regularly.

- Maintain contact with students through announcements, email, discussion boards, etc.
- Use discussion boards that enable knowledge building to take place and provide opportunities for collaborative learning.
- Create online tutorials that can build learning communities, offer students the opportunity for greater reflection and provide a further means of support.
- Create greater peer support through discussion boards, particularly for distance learning courses.
- Offer students a ‘virtual’ meeting place for group work.
- Use online assignments, tests, etc that can provide instant corrective feedback.
- Explore the use of innovative assessment methods

**Step 2: The Blended Approach**

The ‘blended approach’ works on the principle that what you do as a tutor in the face-to-face elements of your teaching will be supported by what you do in the online environment. It is not about repeating what you do in the face-to-face situation. Although we talk about a ‘blended approach’ it is useful to remember that face-to-face and online learning are two distinct pedagogies and that while they can work together in harmony, online learning requires a pedagogical shift from that of face-to-face teaching.

When using a blended model, it is about finding out what works best – for example, would the learning outcome be better achieved if you gave your students an e-activity to do rather than giving a lecture? In the online learning environment, students learn best by doing (this could also be said about face-to-face) hence, tutors who already use the concept of student-centered learning are well placed to transfer their teaching to the online environment. However, the physical absence of the tutor in the online environment means that you as the tutor have to become more concerned about how students learn – you have to become more concerned with the process of learning.

At a lecture, students will take notes. These notes will be based upon what they think are the important points of the lecture. For many students, the important points are those that the tutor will repeat or emphasize through body language, all of which is lost in the online environment. Simply putting notes on a file does not convey to students the important areas nor does it help them to learn. Backing up these notes with lectures that simply cover the notes will result in students not attending the lectures.

Getting the ‘blend’ right therefore will only be achieved through a process of trial and error.

**Step 3: Engaging Learners in Collaborative and Peer Learning**

**Question:** How can Sakai help the tutor to gain greater engagement with learners?

**Answer:** There are a few tools within Sakai which if used properly, can help your learners take a deeper approach to their learning:

The communication facility one of the benefits of the discussion facility within Sakai is the ability to create online learning communities where collaborative learning becomes a major element of the course. Through this type of interaction, learners can gain a great deal of support from both the tutor and perhaps more importantly, from other learners. Such support can be vital for effective learning and this type of peer support can be taken a stage further to include peer assessment and evaluation.

Used properly, discussion boards can:
• Provide students with greater opportunity to reflect on what was said than that of a face-to-face tutorial.
• Be an excellent resource of information for students to refer to when they are faced with writing an assignment.
• Offer students the opportunity to write down their thoughts and ideas before starting on any assignments.
• Aid peer support and opportunities for critical reflection.
• Provide flexible assessment and timely feedback.
• All of which facilitate the development of knowledge creation and help students become more independent learners

Step 4: Using assessment in e-learning
Student assessment is one of the primary tasks with which we are all faced. Although online assessment is being used by a growing number of staff, the main regime for continuous assessment takes the form of coursework.

The coursework form of assessment is very valuable in helping students focus on critical topic issues, but it carries an administrative burden that sometimes prevents students from obtaining feedback on their efforts. For many students this delay can be a disadvantage, especially for those who have failed to grasp the subject in the depth that we would want.

The use of online assessment methods, for example online quizzes, can provide a channel through which immediate feedback can be provided.

Online assessment can take two forms, i.e. summative or formative.

Since summative assessments contribute to the final result of a course of study, supervision is, in most cases, a necessary requirement to ensure compliance with the ITI regulations. On the other hand, formative assessments are intended to provide opportunities for diagnosis, practice and knowledge consolidation accompanied with supportive and corrective feedback. In these circumstances supervision is unnecessary and administrative overheads are limited to the design and deployment of the assessment consequently the most common application of e-assessment is non-supervised formative assessment.

Early online assessments systems were limited largely to the use of multiple choice question formats. These limitations have been overcome and now many systems offer the tutor an extended range of questions types from which to build their assessments. For example there are 15 different question types in our Sakai system, many of which can incorporate graphics, audio and video components.

• The Output of ITI Model II is the graduation of eLearning specialists using blended learning approach

Results
• Graduation of two intakes for eLearning specialists’ (58 eLearning graduates) in 2007 and 2008, are working now in different domains in branded eLearning companies as Instructional Designers, e-Content developers, Multimedia developers, LMS administrators. E-content quality assurance.
• Developing the eLearning concepts and fundamentals courses as WBT, and published online on our LMS Sakai.
• Conducting the current eLearning track (65 students) using the blended learning approach

Business Benefits
Because the figure of the return on investment is based on a purely, quantitative approach of an initiative, the figure may often be
disappointing, because the most impressive results of an e-learning project are often to be found in more ‘softer’ criteria. Often, organizations are recommended to make cost/benefits analysis, using four categories:

- **Hard cost savings**, which include travel and lodging costs, on facilities, tutor fees, printing, distribution and storage costs which may be reduced.
- **Hard revenue impacts**, including the opportunity costs of not having adequately trained personnel, the increased productive time on the job, a shorter time to deployment of a new product or service, the increasing sales effectiveness of selling partners and an increased revenue by introducing training ‘for fees’.
- **Soft competitive benefits**: knowledge transfer is more accessible, training delivery is more consistent, knowledge may be certified on a large scale, expert can now perform the job, and they do not need to teach classes, morale increases through equal training capabilities.
- **Soft benefits to individuals**: which include just-in time activities are available, trainees know ‘where they stand’, which motivates them; learning priorities are clearly prioritized; progress is being watched and evaluated positively.
Conclusion

E-learning is no longer an emerging technology. Our pioneer experience in ITI Egypt has proved that e-learning has a very good chance to spread over, compete and may replace the other conventional platforms in the region. ITI succeeded on the short run to:

- Increase the awareness of eLearning culture in Egypt
- Create a successful model of e-Content design and development to resolve the problem statement declared in the survey made about eLearning in Egypt (stated in the motivation part).
- Use an intelligently-deployed approach to blended learning to supply the Egyptian market with eLearning specialists of instructional design and content development.

In conclusion, ITI plays a significant role in the eLearning domain to satisfy the needs in eLearning in terms of training, content development, support, and consultation.
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