TABLE OF CONTENTS

REPURPOSING CONTENT FOR ONLINE LEARNING: A CASE STUDY OF THE CANADIAN OPEN UNIVERSITY

Stella Lee (Athabasca University, Athabasca, Alberta, Canada, stellal@athabascau.ca);
Corinne Bossé (Athabasca University, Athabasca, Alberta, Canada, corinneb@athabascau.ca)

ABSTRACT

Following the adoption of new Strategic Plans, Athabasca University has been in the process of transforming its print-based courses to online content delivery for the past five years. This paper aims to report on the recent developments and issues on this transition, specifically, the steps and strategies the Educational Media Development team took to assess existing content and how to repurpose them for e-learning. Strategies such as how to adapt print production to online learning; the integration of various components of course websites; and the move towards integrating content into learning management system such as Moodle. This content development and migration process is particularly complex in the context that is characterized by self-paced, individualized study, continuous enrolment and an asynchronous mode of distance education delivery at the undergraduate level.

1. INTRODUCTION

Throughout the last decade–and during the mid 1990s in particular- there was a shift in educational policy towards integrating online learning as core educational practices in Athabasca University, Canada's Open University. One of the outcomes of that educational policy shift has been the adoption of new Strategic University Plans (SUP) that resulted in an in-depth review process of distance and e-learning curriculum development practices. The SUP of 2002 made a significant break from the past. It projected online delivery to be core delivery and print-based to be optional for the University by 2006. This was a wake up call for the traditional print-based delivery adherents within the institution since processes, designs, and production procedures had to be reoriented toward online production and delivery (Bossé & Powell, 2004). Concurrently, the role of e-learning in the University's overall distance education effort is maturing from isolated pilot projects to an integral part of course delivery and support (Bossé & Powell, 2004). Overall, the consolidation of e-learning practices has been an on going effort at all levels of the institution rather than one sweeping reform. This case study aims to report on the recent development and issues of this transition. Specifically, the steps and strategies the Educational Media Development team took to assess existing content and how to repurpose them for e-learning.

2. EDUCATIONAL MEDIA DEVELOPMENT FRAMEWORK

Athabasca University's Educational Media Development (EMD) department was established in 1995 as a central unit to manage the design and development of print-based course delivery and digital technologies for education and research. According to the mandate, EMD aims to provide the university community with the administrative, creative, and technical infrastructure to:

- design and develop high-quality course material
- enhance delivery of courses and services to students

The department plays a key role in the implementation of course design and development, copyright, and other relevant policies and standards, and provides central coordination of the course development process. EMD is composed of editors, visual designers, instructional designers, copyright officers, and digital media technologists (typesetters), and has existed in its present form for almost five years. The instructional designers are a more recent addition to the group, and it is largely their explorations and findings that have influenced the consolidation of e-learning in distance education within the department (Bossé & Powell, 2004).

Course team-based approach is the cornerstone Course team-based approach is the cornerstone of the workflow process. In a nutshell, the role of the editor is 'to ensure the course materials are correct, coherent, internally consistent and that they conform to the University's editorial standards; the role of the visual designer is to ensure illustrations, charts, graphics or other visual designs are reproduced correctly, are internally consistent and conform with the University standards; the instructional designers consult on instructional strategies and assist with selection, design and production of courses while incorporating instructional design principles' (Course Authors Guide, 2002, p.7-8). The EMD staff liaises continuously with respective Academic Centres, the Library, Course Materials Production Unit, Computing Services, Learning Services, and the Office of the Registrar.

3. BACKGROUND ON CONTENT AND CURRICULUM DEVELOPMENT

The introduction of the E-Learning Plan, which flows from the SUP (2002-2006), renewed the effort by the instructional designers to share and gain consensus on best practices from their experiences with online course projects in different academic centres. Authorization of more online delivery would mean greater volume of online production and support. It also had significant implications about which the editors and copyright officers were very much aware of. Previously, if there were copyright, content, or budget issues which prohibited placing material online, those material could be delivered in print. From then on, new solutions needed to be found in order to deliver all these material online. Consequently, consolidating current processes, practices and standards was seen as essential to adapt to the shift. Athabasca University has been employing a seven-phase course development model over the past 25 years (Course Coordinator's Guide, 2003). This process ensures that course development is consistent across the University and is aligned with operational plans. The seven phases are explained below:

Phase 1: General Program Planning

This concerns with the long-range educational planning that determines the criteria by which new or existing programs are developed, revised, or cancelled.

Pre-phase 2: Short Proposal

A short proposal for a new program is circulated among the Academic Centres. It allows for a full discussion of options to cross-list courses and modularizes others for adaptation to different disciplines, thereby helping to avoid duplication of effort before significant investment is made in program development.

Phase 2:Individual Program Planning

This is the phase to determine courses, levels, and course relationships within programs identified in Phase 1. This planning is based on the approved proposals developed according to guidelines set by the University's Academic Council, Governing Council, and Advanced Education.

Pre-phase 3: Preliminary Course Proposal

At this stage, a preliminary course proposal is circulated to provide opportunities for cross-listing, modularization, joint use of curricula and avoid duplication.

Phase 3: Individual Course Plan

In Phase 3, course planning takes place leading to a detailed development process for the specified course, the Phase 3 Report. The Report includes details such as the components of the course, delivery mode(s), cost, and the resources required to develop the course.

Phase 4: Course Materials Preparation

Here, course material are prepared in accordance with the course specifications described in the Phase 3 Report.

Phase 5: Delivery and Tutoring

Delivery and tutoring of the course are undertaken according to the delivery specifications described in the Phase 3 Report.

Phase 6: Course Evaluation

The focus of Phase 6 is on evaluation of the teaching effectiveness of the course. It involves collection of data from a variety of sources.

Phase 7: Course Revision

Each course is assessed annually according to the following criteria: the relevance of the material; the currency of the texts and other purchased materials; the rigor of the course content; the accuracy of the materials; the currency of tests and assignments; and the transferability to other universities. A revision is conducted on the basis of the assessment.

Thus far, this course development model has worked well in a print-based course delivery mode with the assumption that once the print materials have been produced, it leaves little room for changes until the next revision cycle. It is a one-way, waterfall approach to course production with a very tightly integrated structure where workflow follows from one unit to another. For the online environment, however, this model cannot be replicated. Online course development requires a much more agile, iterative and adaptive cycle that works with the medium.

4. REPURPOSING CONTENT FROM PRINT TO E-LEARNING

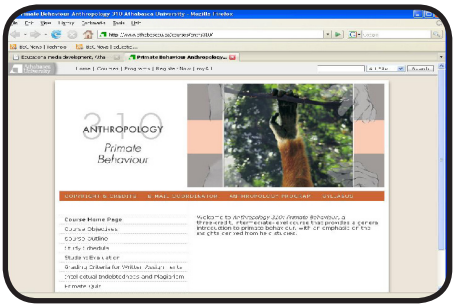
In 2003, the University received a $1.5 million CDN, fast-tracked, one-time grant from the Alberta Learning Access Fund to develop and implement an E-learning Accelerator project. The outcome of this project was to redevelop 150 high enrollment courses for online delivery to be completed by fall 2005. The project charter stated that the University was not charged to create new courses or to build a Learning Management System (LMS) from scratch. The courses were selected by registration volume and the idea was that a maximum number of students would benefit from this project. Courses across disciplines such as Psychology, Computer Science, English, Business and Commerce were included and a taxonomy of online categories was devised to guide the enhancement of these courses. Our first challenge in creating e-learning courses was to define what "online learning" means to our institution. By identifying taxonomy, we aimed to define what this project was trying to achieve and what levels of online learning we were engaging the students. The taxonomy that defined various level of online learning is listed in Table 1:

Names	Contents
Functional	Provide practical/peripheral information such as syllabus, e-mails, tutor informational
Distributional	Provide relevant course material such as text, video, audio, e-journals
Interactional	Provide learner interactions such as simulations, games, quizzes.
Communal-Individualized study	Provide pear-to-pear or pear-to-tutor communication via discussion forum, chat rooms, VOIP in a self-paced learning environtment with flexible start dates.
Communal-Group study	Provide pear-to-pear or pear-to-tutor communication via discussion forum, chat rooms, VOIP in a self-paced learning environtment with flexible start dates.

Table 1: Taxonomy of Online Learning

With funding from this E-Learning Accelerator project, incremental stages have been developed to migrate all 150 print-based courses online. To initiate the process, a basic course template has been designed and established (See Figure 1 below). This template was made available online for all interested parties as a starting point for presenting course material online. The course development team incorporated the functional and distributional aspect of online learning from the printed version of the student manual as the first level of online engagement. The standard information included course description, course materials, course objectives, study schedule, student evaluation, grading criteria, etc. The team's visual designer also attempted

to standardize the look and feel of all Athabasca University courses while providing enough room for personalization within each course. For example, course coordinators/professors worked with instructional designers to add interactive quizzes, links to downloadable reading files, e-journals and websites as well as more complex learning objects. These websites are open-access with password protected areas for online discussion forums and any copyrighted material that are only available for registered students.



In terms of developing e-learning material, our focus was on the transition of print material to online enhancements. For the focus of the E-learning Accelerator project, the course teams did not design courses from scratch. The aim was to integrate online components to existing print course materials rather than replacing them. It served as an interim solution before the University could decide on an LMS as an institutional wide platform for e-learning.

5. INTEGRATING CONTENT INTO LEARNING MANAGEMENT SYSTEM

Moodle is Athabasca University's online Learning Management System (LMS) of choice. A LMS, by definition according to Paulsen (2002), is "a broad term that is used for a wide range of systems that organize and provide access to online learning services for students, teachers, and administrators. These services usually include access control, provision of learning content, communication tools, and organizations of user groups." Prior to the selection and implementation of Moodle in 2005, the University operated largely on a print-based format and deployed three online learning platforms. As the University was moving to online course delivery mode, there was a need for a more centralized, flexible system to support the ongoing development of electronic interactive content. As a result, Moodle has emerged as the single, University-wide LMS. There are many advantages of selecting Moodle over other LMSs. For instance, Moodle has been developed as an Open Source software project; hence, it is available free of charge with no licensing cost attached. Worldwide, there are over 1,150 organizations in 81 countries registered as Moodle users. It has a growing community of practitioners and an active online discussion forum where developers and educators actively contribute to the creative usage and added functionality of Moodle. In addition, Moodle is built on a user friendly template with "social constructionist pedagogy"(Moodle website, 2007). It also allows for the integration of a wide variety of learning objects and interactivities such as blogs, wikis, discussion forums, quizzes, and chat rooms which are easily configured to suit our self-paced, asynchronous study mode at the University. As part of the strategic plan to implement Moodle, the project has been broken down into two phases. For Phase 1, the aim was to:

- Determine system architecture and then install Moodle
- Test and pilot system using test courses
- Develop templates, workflow and guidelines
- Convert pilot course content and pilot-templates
- Integrate Moodle within existing University systems
- Develop user support and training
- Develop research and development environment
- Train staff in their respective centres

For Phase 2:

- Implement Moodle across all academic centres in a group(department) by group process

During Phase 1, eight undergraduate courses were made available on March 21, 2006, with registration for May 1 and June 1 start date as test courses. The undergraduate courses chosen for the pilot phase were high enrollment courses with online components and

interested professors and tutors. These courses are across disciplines including Accounting, Criminal Justice, Computer Science, English, Health Studies, Women's Studies, and Management Science. A maximum of 20 students were allocated for each course. At the time of this writing, all graduate courses have Moodle course websites and the University is aiming for October 1, 2007 as the start date for undergraduate courses made available across several Academic Centres.

6. CHALLENGES AND OPPORTUNITIES

Definition of online courses

Our first and foremost challenge lay in defining online learning. What exactly constitutes e-learning? What does an online course looks like? Although we have identified the taxonomy as mentioned above, the University as a whole still needs to further define which level of online learning experience to provide the students. There has been a lack of user feedback in this regard. At present, more pilot studies and evaluations need to be done. In addition, the changing nature of e-learning means the staff are constantly updating the definitions and re-evaluating the decision making process on online course development within EMD.

Managing change and expectations

Staff and faculty across the University were accustomed to print-based course delivery with a rigid production process. The course development workflow has traditionally been a very tightly integrated, linear process with the emphasis on production rather than a collaborative and iterative cycles of course design. Furthermore, the roles of the team members within EMD were often unclear and some are overlapping and changing as we moved from print to online delivery. For example, the role of the Instructional Designer is shifting - the new role is many folds and that includes project management, needs analysis, course design and development, liaising with various stakeholders, conducting evaluation and quality control, etc. Globally, "the role of instructional designer has risen as a result of the increasing presence of web-based instruction." (Pan, Deets, Phillips, & Cornell, 2003). As a result, over the last five years, the number of instructional designers has increased from one to seven within EMD. The increase in number of instructional designers has resulted in a shift in mentality towards online learning. Instructional designers are perceived as change agents to bring in new ideas, perspectives and skill sets to the course team at large. As the University moves along toward adopting e-learning as the core practices, staff also need to deal with the change in roles and responsibilities within the course team.

Change in course design

c to be driven only by technology forces. Currently, very little research has been conducted regarding this mode of learning and the effective u se of LMS for it. Opportunities are available for further research studies in this area. There is a small number of pilot projects under development to further investigate what kinds of instructional models work best for courses that do not have a semester-based structure, with students joining in and leaving the course at any given time. Specifically, Moodle is designed for paced study, with semester system like the majority of the LMS available in the market. At the institutional level, we need to think strategically how to adapt and configure Moodle to accommodate our niche market.

Large scale deployment/implementation of courses in LMS

Due to the large scale deployment of courses, we have learnt to adapt by selecting a rapid implementation template for migrating content to Moodle. One of the practices is to use Moodle as an entry point but not extent past putting the functional content such as syllabus, course outlines, online discussion and course announcements. Course content will be added at a later date when all courses are made available in Moodle. Currently, the majority of the course websites have only basic functions available and are used

as supplementary material for the courses rather a full replacement for print. Large scale deployment/implementation of courses in LMS Due to the large scale deployment of courses, we have learnt to adapt by selecting a rapid implementation template for migrating content to Moodle. One of the practices is to use Moodle as an entry point but not extent past putting the functional content such as syllabus, course outlines, online discussion and course announcements. Course content will be added at a later date when all courses are made available in Moodle. Currently, the majority of the course websites have only basic functions available and are used as supplementary material for the courses rather a full replacement for print.

7. CONCLUSION

To conclude, the world of higher education, particularly in distance learning institutions is changing. There are changes in instructional design, learning technology, curriculum production models and management of personnel. The development of course design must keep abreast of such changes, in order to continue to provide quality instructional and learning material. At Athabasca University, we need to be mindful of these changes in order to survive the increasing global competition in the distance learning market. At an individual level, staff and faculty also need to acknowledge and manage this change with cross-functional communication, open dialog and clear role definitions and expectations supported by upper management.

REFERENCES

Athabasca University Strategic University Plan 2002-2006. Retrieved August 3, 2007, from http://www.athabascau.ca/sup/sup_19_06.pdf

Bossé, C. & Powell, B. (2004). The "Process of Maturing": Coming of Age of Distance and E-Learning Practice at Athabasca University. Session presented at the European Distance and E-learning Network, Budapest, Hungary.

Course Coordinator's Guide. (2003). Retrieved August 3, 2007, from http://emd.athabascau.ca/resources/course_coordinators_guide.pdf

Moodle Docs. (2007). Retrieved August 3, 2007, from http://docs.moodle.org/en/Philosophy

Pan, C.-C., Deets, J., Phillips, W., & Cornell, R. (2003). Pulling Tigers' Teeth Without Getting Bitten: Instructional Designers and Faculty. The Quarterly Review of Distance Education, 4(3), 289-302.

Paulsen, M. F. (2002). Online Education Systems: Discussion and Definition of Terms. Retrieved August 3, 2007, from http://www.nettskolen.com/forskning/Definition%20of%20Terms.pdf

EFFECTIVE TEACHING AND LEARNING THROUGH DIGITAL COURSE CONTENT DEVELOPMENT: A UITM MODEL

Mohd Nor Mamat , Mohd Nor Hajar Hasrol Jono , Azlan Abdul Aziz , Nurmaisara Za'ba
MARA University of Technology, Shah Alam, Malaysia
mohdnoor@salam.uitm.edu.my, hasrol@tmsk.uitm.edu.my,azlanaa@tmsk.uitm.edu.my,
maisara@tmsk.uitm.edu.my

ABSTRACT

Electronic Learning (e-Learning) is not new in today's education system. The success of e-Learning application depends not only on the info structure and the Learning Management System (LMS) but also on the content fulfillment to be uploaded and downloaded. Dependency on the system and the info structure does not cater to the successful teaching and learning process without the distributed and accessed information or the module. The lackluster of the content fulfillment in the smart school project serves as a reminder that a proper and thoroughly thought out plan on training and digital content development must not be overlooked. In the realm of tertiary education, the requirement for online learning is of great relevance in line with the society needs to have tertiary education due to the constraint of campus capacity. UiTM is a unique university with 12 branch campuses and over 150,000 students around Malaysia. The question is actually to gauge on the content development for huge number of users, considering user-friendliness, efficiency, effectiveness and meet the humanistic aspects at the same time. Therefore the issues of technology and facility, infrastructure as well as the capability of the lecturer are in questions requiring fast and continuous solution. This paper intends to share the experience of developing LMS in UiTM and the challenge in providing effective digital course content throughout the whole university. The focus of this paper is the successful attainment of the objectives in the e-Learning development plan that is efficient, effective and cost-friendly.

Keywords: e-Learning, content, LMS

1. INTRODUCTION

The beginning of the Internet in the 80's brings forth the advent of electronic learning mode in the Malaysian society at large. Electronic learning or e-Learning began when the use of electronic medium material in the teaching and learning environment even before the introduction of the Internet. Of late, e-Learning is characterized as the life long learning mode thus receiving the accolade and warm reception of the global community. Society begins to comprehend the importance of knowledge and information hence the acceptance of the e-Learning concept as the contemporary learning model of the future. E-Learning at its fundamental value is defined in a myriad of perspectives. However, it can be categorized as learning through the use of electronic materials, computer based learning, online learning, virtual learning and many others. Basically, e-Learning is the contemporary learning style that uses the electronic medium comprehensively including the implementation of a learning management system.

2.i-LEARN PORTAL

UiTM started its first phase e-Learning development project in the early 1990's with the complete involvement of Mesiniaga. This was followed by the second phase, utilizing a different vendor, at the branch campuses throughout the country. It was then succeeded by the third phase with the cooperation of lecturers responsible assuming the role of the subject matter expert, graphic and instructional designer, programmer, animator typist and the likes. The first and third phase incurred an enormous cost, thousands of Ringgit, with only a few courses successfully developed. Raja Maznah Raja Hussain (2005) discovered that the e-Learning development at the

institution of higher learning in Malaysia still depended on the ICT professional experts and not the academia hence the technocentric characteristic rather than pedagogic or andragogic. But this did not influence the LMS development in UiTM which focused on the academia functioning or serving as contributors and content developers with the andragogic mindset. Then the fourth phase witnessed the UiTM shift to the Open Source application by developing its own LMS with the assisstance of a vendor who trained the in-house experts with a far more reduction in cost. This has solved the main obstacle in each LMS development that is the finance limitation (Raja Maznah Raja Hussain; 2005). The reduction in cost provided more advantages by giving more exposure to the academia in terms of comprehensive teaching technology application and enjoy the return in the form of high academic professionalism. These fulfill the criteria of excellent and effective e-Learning application. Since the middle of 2005 until March 2006, about 80% of the total 4000 university lecturers have been online by providing more than 600 learning materials from the total courses offered. This achivement is something to be proud of because the development was made possible by using the in-house experts namely the academician themselves who truly embrace the education concept as well as the teaching and learning methodology. This feat became the answer to the ever-increasing technocentric concern on the development of learning materials. The university LMS was developed on an acceptable budget but nevertheless able to include almost all courses comprehensively with the aid of the academicians in their maximum capacity/involvement without any burden. The adoption of Open Source with the suitable interface is inline with the university's image and requirement, myriad of contents (buffet approach) from as simple as these formats i.e. .doc, .ppt and .xsl or .pdf to the flash format (.swf) and executable format (.exe), static, dynamic or interactive approach depending on the level of requirement have bring tremendous recognition and success among the university community. At the same time it was designed with the systematic and comprehensive instruction principles thus fulfilling the e-Learning requirements (Smith; 2005) as well as that of Macromedia, the World Summit of Information Society and Open Source. From the perspective of the system application, this LMS is connected directly to the Student Registration System (iSIS), Timetabling System (ICRESS), Student Portal (i-Student) and the Staff Portal (i-Staff) of the University. This further enhanced the existing quality of the LMS providing great usability and integration without isolation. Among the future development are the campus wireless network facility (a project by the Ministry of Higher Learning and the UiTM Staff Cooperative), continuous training regarding campus wide learning technology all over the nation, upgrading the server capacity at each faculty and branch campuses as well as other strategic plans towards continous improvement of the current system. Since its inception in December 2005 until mid 2006, the i-Learn Centre in UiTM has successfully trained almost all academicians with the basic skills of phase 1 involving the basic applications such as Flash, Acrobat and advanced Microsoft Office functions such as security, design, animation and the likes Conceptually, the UiTM LMS was developed with the involvement of all academicians playing the roles of Subject Matter Expert (SME), Instructional Designer (ID), tutor and instructor all at the same time. Therefore the content that was developed fulfill the syllabus requirement, methods and objectives of learning where the lecturer, as a subject matter expert, was actively and closely involved with the development of the material for their own students under the coordination of i-Learn Centre assissted by some ISO personnels. In the management context, such approach made the content development more affordable, easy, simple, concise and reduce great possiblity for errors compared to the combined SME concept with isolated designer and tutor. The model with its centralized and integrated functions made the model at par with the Blackboard requirement in terms of its collaboration factor, centralized integrated function and comprehensive information sharing among a variety of experts. From the user-friendliness perspective, the university's LMS or also known as i-Learn can be accessed through the intranet and the internet with the log-in method similar to the

i-Student Portal. Szarina Abdullah (2006) outlined the factors that impede user-friendliness such as low speed (68%), undownloadable materials (60%), computer problems (45%), disrupted connection (32%), unprintable materials (31%) dan insufficient information on retrieval (30%) and it is proud to say that the LMS in UiTM is not affected by any of the factors mentioned. This is also inline with the Macromedia selection and the e-Learning Awards, what more with the buffet approach which is modularly done has made the LMS relevant to the andragogy aspiration. The intranet and internet facility has made possible fast and flexible access all the time. The preparation of simple teaching material for printable download is also a user-friendly element besides multimedia module for visualization and interactive teaching for computer interaction. i-Learn also provides other facilities/features such as an an nouncement area, which is automatically orga nized, to entice the students on every log-in, theforum space, chat and e-mail. The structure of the learningmaterials is also user-friendly as it is arranged according to the effective instructional design principle. UiTM also considered nine main principles (Mohd Nor Mamat et al; 2006) in the development of e-Learning to ensure the quality and the user-friendliness, which are:

1. ensures availability
2. ensures usability
3. ensures always online
4. ensures that standards are met
5. ensures in the simplest form
6. ensures less dependency of supplementary device
7. ensures fulfilling the users requirement
8. ensures in modular form (modularity)
9. ensures users satisfaction

Without denying the fact that there were a lot of obstacles and limitations in the LMS development (that matured into its second year, not including the previous development phase), the aspects of quality and user-friendliness have always been the focus and this has brings forth a commendable achievement.

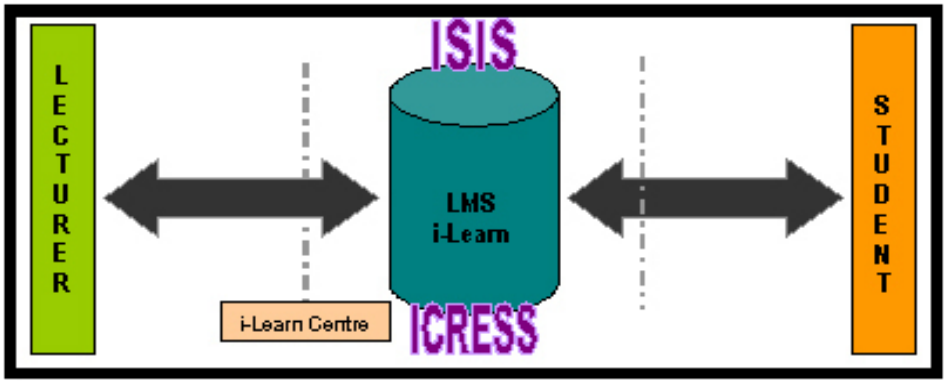


Figure 1: i-Learn Content Development Structure

3. ELECTRONIC COURSE CONTENT

Internet technologies, valuable for information intensive services, have become central to the success of educational institutions (Mazzarol, Soutar & Seng, 2003; Gomes & Murphy, 2003). Malaysian universities use Internet technologies to improve the quality of, and access to education. Integrating online learning in the education process offers flexibility for students (Sweeney & Ingram, 2001), enabling them to access online content "independent of time, place and circumstances" (DEST, 2002; p.1). Digital course content can improve the quality of learning, enrich access to education, and improves education's cost efficiency. It fundamentally changes the delivery of education and training along with how student learn. Flexibility lets student's access course content at any time, place and pace. In UiTM, the only difference between digital course content as compared to the traditional course content will be the delivery mode and its knowledge sharing concept. The digital course content will be uploaded and set available via i-Learn portal, which is

done by the course creator(s)/instructor and it should provide a convenient downloadableversion of content. Since UiTM is a unique university with 12 branch campuses and over 150 000 students connected all around Malaysia, managing learning content is critical. A number of courses will be taught by a number of different lecturers to a number of different groups of students. It is imperative that there exist a means to ensure the standards of content and delivery is maintained all throughout the country. The i-Learn portal is the platform promoting information sharing and resources among academicians and students, providing a standard content for the respective courses for students perusal, extending the discussion beyond the class/office hours and many more benefits. Enriched communications takes place in the portal and high traffic access to the standard electronic course content further proves the worthiness of developing the portal. The latest statistics showed that 96% of the total 5005 course contents are electronically available in the portal and these digital course contents are greatly used by the students in their learning activities. Such offerings of digital course contents are definitely a pull factor for a foreseen extensive usage of the portal. The academicians are all geared up to fully utilize the facilities provided thus increasing the number of active users to 98.9% from the total 4200 academicians. This indicator of vigorous activities is shared in the students' usage statistics where the percentage soared up to 96.6% of the total 161370 students. Statistics from the portal also showed that in July 2007, the bandwidth has reached 90.27 GB with 3560.12 KB/visit for the total visits traffic which among others, owed to the hectic uploading and downloading of digital course contents. In overall, the traffic and bandwidth have been very high, indicating great reliance on the portal, for most of the times except during the semester holidays which saw a slightly lower traffic and bandwidth. Providing good quality and relevant digital course contents, besides offering other useful and usable features, is central to the success of the i-Learn portal or other similar portals.

Table 1: i-Learn portal usage Statistics

Month	Unique visitors	Number of visits	Pages	Hits	Bandwidth
Jan 2007	7681	17806	987088	1911689	50.42 GB
Feb 2007	5254	11423	789031	1583105	85.14 GB
Mar 2007	5934	12769	916300	1804003	106.79 GB
Apr 2007	6272	11788	758121	1491718	82.32 GB
May 2007	3714	5325	223195	452751	33.73 GB
Jun 2007	8866	12671	446248	974478	55.19 GB
Jul 2007	12948	26588	1413946	3425153	90.27 GB

4. CONCLUSION & FUTURE WORK

Today's e-Learning cannot be alienated from the requirement of a comprehensive and integrated Learning Management System (LMS) towards achieving the 24 (hours) x 7 (days) principle of online learning aspiration. Generally, the LMS development incurs an astronomical cost compared to the conventional 'talk and chalk' learning method. However, the higher return that LMS offer such as the capacity and capability of insufficient class space, time and the ever-increasing student population in the world of knowledge certainly justify such investment. Whether we like it or not, the planning towards the LMS development should begin any time soon and the selected models should be shared for the global benefit. The digital content development model for the learning system application can be considered efficient, effective and worthy as well as satisfying most standards of the excellent learning system around the world. To date, the i-Learn portal can be said to be savoring sweet success in its infancy level, at the same level where others have stumbled. However there are more studies to be conducted in further empowering

the portal as a world class facility analogous to the reputation of UiTM as a world class university. In turn, UiTM can rise to the challenge and is ever ready to serve the country's aspiration of becoming the regions' educational

BIBLIOGRAPHY

Szarina Abdullah, Prof Dr (2006). "Global, Collaborative and e-Learning: Issues and Challenges": International Conference on Distance, Collaborative and e-Learning. Kuala Lumpur: UiTM 4-5 January 2006.

Ahmad Marzuki Hj Zainuddin (2004). "Introduction to e-Learning": Seminar e-Learning. Pulau Pinang: UiTM, 5-7 April 2004.

Asirvathan, David (2003). E Learning: Reshaping Education. Selangor: Multimedia University, 2003.Cheong Weng Seng (2003). "Best Practices Case Study in Asia/ Europe": EU-Asia e-Learning 2003. Kuala Lumpur: PWTC, 10-12 April 2003.

Curley, Martin (2002). "E Learning! Evolution or Revolution?": National Conference on e Learning. Kuala Lumpur: PWTC, 4-5 July 2002.

Daniel, John et al (2006). "e-Learning and Free Open Source Software: The Key to Global Mass Higher Education": International Conference on Distance, Collaborative and e-Learning. Kuala Lumpur; UiTM 4-5 January 2006.

Department of Education, Science and Train ing (DEST) (2002). Students 2002- Selected Higher Education Statistics. DEST, Canberra.

Evers, Hans-Dieter (2001). "Towards A Ma laysian Knowledge Society": Third Interna tional Malaysian Studies Conference.Bangi: Universiti Kebangsaan Malaysia, 6-8 Ogos 2001

Halimah Awang (2001). "ICT Revolution and the Future Workforce": Third International Malaysian Studies Conference. Bangi: Universiti Kebangsaan Malaysia, 6-8 Ogos 2001.

Hassan Said, Prof. Dr. (2002). "Government & e Learning": National Conference on e-Learning. Kuala Lumpur: PWTC, 4-5 July 2002.

Khairuddin Hashim (1998). "Teaching & Learning in A Virtual University Environment": International Conference on Infomation Technology & Multimedia. Kuala Lumpur, 28-30 September 1998.

Mahmud Abd Wahab (2004). "Issues and Challenges of e-Learning Implementation in Malaysia": Seminar e-Learning. Pulau Pinang: UiTM, 5-7 April 2004.

Mazzarol, T., Soutar, G. & Seng, M. (2003). The third wave: future trends in interna tional education. The International Journal of Educational Management, 17(3), 90-99.

Mohd Nor Mamat et al (2006). "Pembangunan Sistem Pengurusan Pembelajaran Berkualiti dan Mesra Pelajar": Proceedings of The National Seminar on Science, Technology and Social Sciences (Volume1). Pahang: Universiti Teknologi Mara.

Mustapha Ahmed, Haji (2002). "New Era in the Education: Experience & Challenges in Developing Smart School": National Conference on e Learning. Kuala Lumpur: PWTC, 4-5 July 2002.

M. V Ramachandra (2002). "Education Through Multimedia: Advantageous and Limitations": National Conference on ICT in Education. Kuala Terengganu: Primula Beach Resort, 1-2 Oktober 2002.

Oh, E. S. (2003). "Proposed Ethical Framework for Resolution of Moral Dilemmas in Learning and Motivation Issues": International Seminar on Learning and Motivation.Pulau Pinang: Corpthorne Orchid Hotel, 13-15 Oktober 2003.

Raja Maznah Raja Hussain (2005). E-Learning in Higher Education Institutions in Malaysia. Kuala Lumpur: Universiti Malaya..

Razali Ismail (2002). "Enhancing Digital Education in Terengganu: The T_iman Approach": National Conference on ICT in Education. Kuala Terengganu: Primula Beach Resort, 1-2 Oktober 2002.

Sellina Chin (2003). "State of the e-Learning Industry in Asia and Europe": EU-Asia e-Learning 2003. Kuala Lumpur: PWTC, 10-12 April 2003.

Smith, Brian Cantwell (2005). Principles & Priorites for a UofT Learning Management System. Canada: University of Toronto.

Sweeney, J. & Ingram, D. (2001). A comparison of traditional and Web-based tutorials in marketing education: An exploratory study. Journal of Marketing Education, 23(2), 55-62.

Syed Othman Alhabshi, Datuk Dr. (2002). "E Learning: A Malaysian Case Study": Africa-Asia Workshop on Promoting Co-operation in Information and Communication Technologies Development. Kuala Lumpur: INTAN, 26 March 2002.

ALGORITHM ANIMATION FOR CRYPTANALYSIS OF CAESAR AND HILL CIPHERS

Sapiee Haji Jamel and Giuseppina Sherry Sayan
(Faculty of Information Technology and Multimedia,
Universiti Tun Hussein Onn Malaysia (UTHM) 86400 Parit Raja,
Batu Pahat JOHOR sapiee@uthm.edu.my, gusche85@hotmail.com)

ABSTRACT

Cryptographic algorithms are usually kept secret and the complexity of each algorithm is based on mathematical or statistical analysis. However, in modern cryptography, the strength of each cryptographic algorithm should only rely on the secret key(s) used to ensure that there is no trap door embedded in the algorithm. This new trend gives an advantage to cryptanalyst since types of algorithm(s) used are no longer a secret. Cryptanalysis steps can be easily explained using algorithm animation that can be easily integrated with any e-learning platform. This paper presents an algorithm animation for cryptanalysis of Caesar Cipher using ciphertext only attack and Hill Cipher using Brute force technique. Each of the steps involved in the cryptanalysis is shown using animation technique developed using Macromedia Flash. This application is suitable for e-learning activities for students interested in the cryptanalysis of block cipher.

1. INTRODUCTION

Cryptanalysis is a branch of Cryptology that deals with finding weaknesses in cryptographic algorithm. Cryptanalysts reveal secret data (plaintext or message) from scramble messages (ciphertext) without knowledge of keys or types of algorithms used. In the past, every elements of the cryptographic algorithms are kept secret and the complexities of each cryptographic algorithm are usually based on mathematical formulation to prove that it is secured from any simple mathematical manipulation or statistical analysis. An algorithm animation combines multimedia tools with other disciplines to simulate how specific algorithm or process work. It offers an alternative method for better understanding of complicated process with a help of computer software (Animation, 2007). Cryptology (study of cryptography and cryptanalysis) has evolved from an art in which it was mastered by several people into a science where it has significance importance especially in the digital communication (Henk et al., 2005). Previously, cryptographers and cryptanalysts (or hackers) worked in isolation in order to protect their own safety. Since the year 2000, both parties have openly developed and discussed any strengths or weaknesses of each algorithm as shown in the process of selecting the United States Advanced Encryption Standard (AES) new encryption standard for encrypting sensitive (unclassified) Federal information (NIST, 2001). Developing a new block cipher and tests it using several known cryptanalysis techniques has become a new trend (Junod, 2005; Piret, 2005; Dunkelman, 2006). Twofish developers (Schneier et al., 1999) cryptanalyzed their own algorithm more than one thousand man-hours with ten known cryptanalysis techniques similar to those described by Standaert (2003) as a proof of its strength. Even though several cryptanalysis of Caesar are available on the Internet, this project attempts to intergrate elements of multimedia (text, sound and animation) in the description of the cryptanalysis process for better understanding (Savarese et al., 2006).This paper presents cryptanalytic process of ciphertext from Caesar and Hill Cipher using algorithm animation to allow better understanding of how the actual process is performed. Software visualization approaches are used in order to understand a complex and time consuming cryptanalysis process (Price et al., 1992). An algorithm animation creates an abstraction of both the ciphertext and the operations of the cryptanalysis process. It also maps the data into an image, which then gets animated based on the operations of the cryptanalysis process. The rest of the paper is organized as follows. Section 2 describes the concept of

cryptanalysis. Section 3 discusses the types of cryptanalysis techniques which can be used on any cryptographic algorithms. Section 4 outlines in detailed Caesar and Hill Cipher cryptanalysis animation algorithm. Section 5 concludes this paper with future work of this research.

2. CONCEPT OF CRYPTANALYSIS

The main objective of cryptanalyst is to find the cryptographic key used to encrypt and decrypt message. An indication of weaknesses can be in the form of the recovery of cryptographic keys used, recovery of plaintext from ciphertext or even the key generation procedure for an undisclosed cipher. Before cryptanalyst can start performing his or her work, the type of data available must be identified whether it is a ciphertext or keys to be used for encryption and decryption. Even though several cryptographic algorithms are published and evaluated openly in journals and conference papers (NIST, 2001), they represent only the tip of the ice berg since most algorithms used by the Governments or military institutions classified properties world wide. One reason for the possibilities of cryptanalysis to be performed on any block cipher is that plaintext (messages), ciphertext and key combination must be finited to ensure unique encryption and decryption of messages. Modern symmetric (similar key for encryption and decryption) cryptographic algorithms use key schedule algorithm using master key to generate different sub-keys for each iterated rounds.The following section discusses basic elements of cryptographic algorithm required before any cryptanalysis can be performed.

2.1 Message

Messages are written using 27 standard alphabets (a..z, A..Z) and then translated into suitable 128 printable ASCII characters. Later, they get converted into 8- bit binary numbers before entering encryption process. Messages are usually grouped into a block of either 128-bit, 192-bit or 256-bit depending on the key length used in the algorithm.

2.2 Encryption and decryption elements

Software implementation of modern cryptographic algorithm utilizes basic Boolean algebra operators (OR, Exclusive-OR (XOR), AND and Modulo arithmetic) for performing their basic routines. Confusion process (DES, Rijndael, Twofish) which translates plaintext into intermediate values (hexadecimal) is implemented using non-linear substitution tables (S-Boxes). Diffusion is implemented using Maximum Distance Separable (MDS) matrices or Pseudo-Hadamard Transform (PHT) as in Twofish.

2.3 Ciphertext

Ciphertext usually consists of a string of binary sequence, which is a mixture of scrambled messages, key sequences and extra information (whitening) added by the encryption process. A common ciphertext block length for modern cryptographic algorithms are 128- bit, 192-bit and 256-bit.

2.4 Key Schedule algorithm

Modern cryptographic algorithms integrate complex procedure to avoid related-key cryptanalysis. This type of cryptanalysis is designed specifically to find any weaknesses in key generation method. Regardless of any improvements implemented by cryptographers, cryptanalyst still can perform on going analysis on cryptographic algorithm offline using all of the above information.

3. CRYPTANALYSIS TECHNIQUES ADOPTED IN THIS PROJECT

The method for performing cryptanalysis can be classified into several areas based on the model use:

3.1 Brute Force Method

This method is still the most efficient attack on any cryptographic algorithms and researchers are actively trying to find the best solutions to this problem (Schneier, 1999; Clayton, 2001). In this cryptanalysis technique, cryptanalyst will try to recover cryptographic key used in an algorithm to encipher or decipher message.

Any successful trial less than the maximum number of possibilities are considered a successful attack on any cryptographic algorithm. The strength of modern cryptographic algorithms is dependent on the property that the resources for performing analysis on the 128-bit key are still limited. Rijndael, Twofish, RC6, MARS and Serpent (AES, 2000) can accept multiple key sizes such as 128, 192 and 256-bit key which might take more than 10x1012 years to get the appropriate key. Maximum number of possible attempts for key recovery allowed for these algorithms is 2128 times. Machine design specifically to perform Brute Force on key space of DES also available in the literature (Wiener, 1993). With Rijndael, this Brute Force technique is time consuming and required vast computing power to get the appropriate result. Most cryptographic algorithms are designed to ensure it is impossible for cryptanalyst to do reverse engineering in order to predict the correct key generated by the algorithm. Keys for encrypting messages are generated from master key. The key generation procedure is usually embedded with confusion and diffusion technique to ensure keys are unique and randomly generated.

3.2 Ciphertext only attack

In this technique, cryptanalyst have the ciphertext only for finding the appropriate plaintext or the cryptographic key used. Statistical analysis of the ciphertext can be helpful.

4. CRYPTANALYSIS OF CAESAR AND HILL CIPHER

4.1 Cryptanalysis of Caesar Cipher using ciphertext only attack

For Caesar cipher, cipher text is generated by shifting the alphabet according to an agreed value (key) and Mathematic modulo operator is used to ensure the total number of possible ciphertext is 26. For example, if the key is equal to 3, every alphabet in the plaintext will be shifted 3 positions to generate the appropriate ciphertext. Snap shots of cryptanalysis process for finding plaintext from Caesar ciphertext are shown from figure 1 until figure 4.

Figure 1 shows ciphertext “HTSKNIJSYNFQ” that is used in the cryptanalysis of Caesar Cipher using ciphertext only attack. Each possible letters are then rearranged according to the next alphabet as shown in Figure 2. “H” is followed by “I”, “J”, “K” and other consecutive alphabets. This will represent all the possible combinations of plaintext for this ciphertext using Brute Force method. Toward the end of this process, a familiar English word will appear as shown in Figure 3 where the word CONFIDENTIAL appear at line 5 of the screen. Result from the cryptanalysis process is shown in Figure 4. Once the meaning of the ciphertext is known to the cryptanalyst, he or she can find the key used for decrypting the message. As for this example, the key used is 3.

Figure 1: Finding plaintext from ciphertext

Figure 2 :All possible combination of plaintext

Figure 3: Meaningful word from the ciphertext

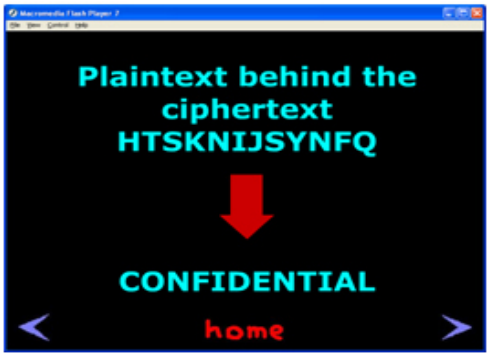


Figure 4: Result from cryptanalysis process

4.2 Cryptanalysis of Hill Cipher using Brute Force attack

Hill Cipher use matrix as the foundation for converting message and the key to create the ciphertext. The process of cryptanalysis for Hill Cipher ciphertext is shown in Figure 5. The ciphertext WUZWFVVNARDZ is then separated into a block of size 2 as shown in Figure 6. With the assumption that the block size is two for this ciphertext, the key must be of two by two matrix. Suitable key for encryption and decryption process must meet two conditions where it must be invertible modulo 26 and a square matrix. Invertible matrix can be easily tested by finding the Greatest Common Divisor (GCD) between the value of matrix determinant and 26. If the GCD value is 1, the matrix is a possible candidate for the encryption key as shown in Figure 8. The next process is to try this matrix with the ciphertext until a meaningful English word appears from the ciphertext. Figure 8 shows a successful outcome from the cryptanalysis process which revealing the message COFIDENTIAL from the ciphertext WUZWFVVNRDZ.

Figure 5: Cryptanalysis of Hill Cipher

Figure 6: Ciphertext divided into block size of 2

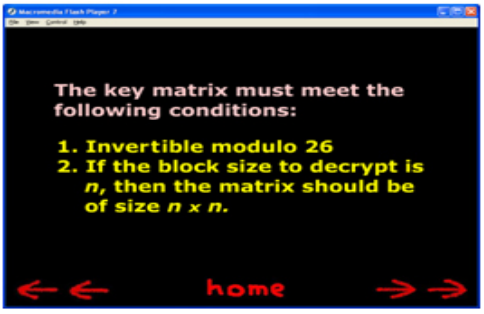


Figure 7: Finding Suitable Key

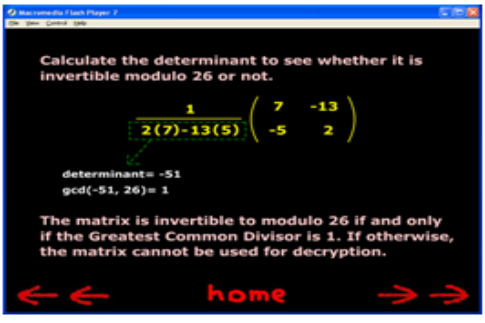


Figure 8: Finding Suitable key for Hill Cipher

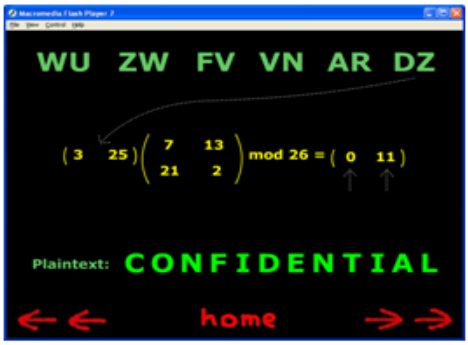


Figure 9: Meaningful message from the ciphertext

5. CONCLUSION

Algorithm animation has been accepted in research communities as a key element to understand complicated algorithms better. It has been widely used to explain the steps involved in algorithm via multimedia application. Even though this project only looks at the cryptanalysis of two simple block cipher, the process involved in designing the algorithm animation can be extended to modern cryptographic algorithms such as Rijndael and Twofish. Cryptanalysis animation developed using Macromedia Flash can be easily integrated to any e-learning platform for making learning basic cryptanalysis process of cryptographic algorithm fun.

REFERENCES

Animation 2007. Introduction to Algorithm Animation,URL:http://www.ickn.org/elements/hyper/cyb105.htm(Accessedon2February2007)

Biham E. and Shamir A., 1991. Differential Cryptanalysis of DES-like Cryptosystems. Journal of Cryptography, 4(1):3-72. Clayton R., 2001. Brute Force Attacks on Cryptographic Keys, URL :http://www.cl.cam.ac.uk/~rnc1/brute.html Accessed on 4 June 2007.

Feistel H., 1973. Cryptography and Computer Privacy, Scientific American. 228(5): pp 15 -23.

Henk C. A. and Tilborg V., 2005. Encyclopedia of Cryptography and Security, Springer, United States of America. Junod P., 2005. Statistical Cryptanalysis of Block Cipher, Ph. D. Thesis, Ecole Polytechnique Federale De Lausanne.

Matsui M., 1993. Linear Cryptanalysis Method For DES Cipher, Advances in Cryptology, EUROCRYPT 93: Workshop on the Theory and Application of Cryptographic Techniques, Loftthus, Norway, May 1993. Proceeding, volume 765 of LNCS, pages 386-397. Springer-Verlag.

National Institute of Standards (NIST) FIPS Pub 197: Advanced Encryption Standard (AES), 2001. http://csrc.nist.gov/publications/fips/fips197/fips-197.pdfAccessedon22March,2005

Price B. A., Small I. S. and Baecker M., 1992. A Taxonomy of Software Visualization, Proceedings of the Twenty-Fifth Hawaii International Conference on System Sciences.

Savarese C. and Hart B., 1999. The Caesar Cipher, URL : http://starbase.trincoll.edu/~crypto/historical/caesar.html , Accessed on 4 June 2007.

Standaert F.-X, Piret G. and Quisquater J.-J., 2003 Cryptanalysis of Block Ciphers: A Survey. UCL Crypto Group Technical Report Series. Technical Report CG-2003/2 http://www.dice.ucl.be/crypto/tech_reports/CG_2003_2.pdf(Accessedon17February2006).

LEARNING BASIC CONCEPTS IN CHEMISTRY USING VISUAL BASIC APPLICATIONS

Mr. Borhannuddin Arifin
Faculty of Applied Sciences
University Technology MARA
40450 Shah Alam
borhan545@salam.uitm.edu.my

ABSTRACT

In the Information and Communication Technology (ICT) age, we use computers for a variety of reasons e.g to write reports, manage database, solve mathematical problems and to serve the internet for educational, personal or commercial purposes. Most of the time we will use application softwares to do a given task. There are softwares such as Visual Basic (VB) that can be used to create graphical user interface application programs to solve problems that are of interest to us. This work, which is still at its early stage of implementation, will demonstrate the use of VB by creating a simple application program known as ChemVB. Basic concepts in chemistry such as conversion of units and calculation of molecular weight of a compound will be demonstrated. This work can be expanded to include other topics in chemistry.

1. INTRODUCTION

We are living in the Information and Communication Technology(ICT) era and computers are used in many different fields by different groups of people. Some of us use computers to serve the internet, write reports, manage database while others especially in the scientific community use computers to do modeling, simulation, calculate molecular properties or solve complex problems. If you are a programmer, you can develop your own application softwares; otherwise we just buy a certain software that suits our requirement to do or solve a given task. There are also softwares that we can use to develop our own applications that suit our needs. One such application is the Microsoft Visual Basic for Applications or VBA for short. VBA is an object-oriented programming language that can be used to create graphical user interface (GUI). A GUI is a graphical (rather than purely textual) user interface to a computer. Elements of a GUI include such things as: windows, pull-down menus, buttons, scroll bars, iconic images, wizards,the mouse and probably many things that have not been invented yet. An application known as ChemVB has been developed using VBA. The ChemVB has three programs

a) Conversion of units
b) Molecular weight calculator
c) Periodic Table

The purpose of developing this application is to use VBA as a tool to assist students in learning basic concepts in chemistry. This work will demonstrate how to use ChemVB. Step by step instructions on how to run the application are given in the next section. Other concepts or topics in chemistry can also be developed. The author used (McKeown, 1999) as a reference for VBA programming and specific applications of VBA in chemistry can be found in (Sime, 2005). Incorporating VBA into Excel is described in (Billo, 2001). It is up to one's creativity to explore all the available features of VBA. With routine use and practice, one can design and create an application that is of professional quality.

The ChemVB

The ChemVB application was developed using MS Visual Basic 6.0. Basically three steps are involved when a programmer wants to develop an application.

a) Creating the user interface (the form and its embedded controls)
b) Setting the properties of the controls (caption, name, size, color and other properties)
c) Writing the code (attaching theVisual Basic code to the controls)

Details for creating GUI will not be discussed here but the instructions on how to use Chem-VB are as follows:

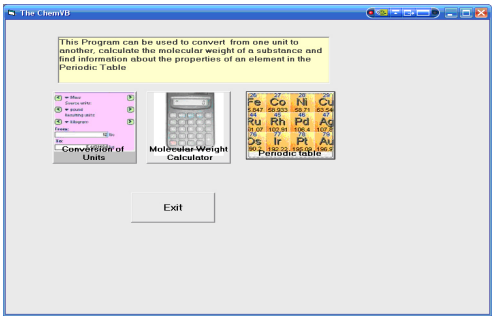


Figure 1: The ChemVB main window

Instructions to Open ChemVB

1. Open ChemVB.exe
2. A window similar to Figure 1 is dis played. It shows the three different programs available in ChemVB.
3. Select any of the three programs.

Program 1: Conversion of Units

This program converts the following quantities.

Quantity	From	To
Temperature	^{o}C	K and ^{o}F
Pressure	bar	atm and Pa
Volume	m^3	cm^3 and L
Energy	J	cal and Latm

Instructions

1. Select The Conversion Program button.
2. Fill the first column with values of the respective quantities. All four must quan tities must be filled with values. The example in Figure 2 shows a value of 1 for each quantity.
3. Click the calculate button.
4. The screen will display the converted values in the next two columns for all four quantities.
5. Click the clear button to repeat using dif ferent values.
6. Click exit to go to the main ChemVB window.

Program 2: Molecular Weight Calculator

This program demonstrates the calculation of the molecular weight for a given compound that consists of up to three elements. This program will also calculate the percentage by mass of each element present in the compound.

Instructions

A. Molecular weight for compounds with 3 elements e.g H3PO4

1. Click the Molecular Weight Calculator button in the ChemVB main window.
2. Click the down arrow of combo box for the first element. Choose H
3. Click the down arrow of combo box for the second element. Choose P
4. Click the down arrow of combo box for the third element. Choose O (Figure 3).
5. In the next column, insert the number of atoms for that element, 3 for H, 1 for P and 4 for O.
6. Click the Calculate MW button. It will display 157.92 as the molar mass for H3PO4 and also the percentage by mass for each element. The formula for the compound is also displayed.
7. Click the clear button to repeat the calcu lation for a different compound.

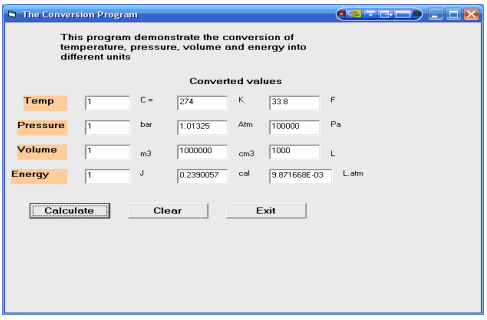


Figure 2: The Conversion Program

B. Molecular weight for compounds with two elements (e.g CO2)

1. Choose C for the first element and insert 1 for number of element for C
2. Choose O for the second element and insert 2 for number of element for O
3. Since there are only 2 elements (C and O), for the third element select X. This is a dummy atom that has mass of 0. So that its total mass regardless of number of atoms is 0. You must also insert a number for number of the third element.
4. Click the Calculate MW button. It will display 44.01 as the molar mass for CO2. (Figure 4)
5. Click the clear button to repeat the calculation for a different compound.
6. You can also view the instruction by clicking the Read Instruction button.
7. Click the exit button to go to the main ChemVB window

Program 3: Periodic Table

This program allows the user to choose an element in the Periodic table and obtain a description of the element.

Instructions

1. Choose the Periodic Table window in the ChemVB main window. (Figure 5)
2. Choose an element by clicking on the icon of that element. For example click Na. A description of the element Na is shown the empty box at the bootom right of the window.
3. Repeat by choosing other elements
4. Click the exit button to go back to the main ChemVB window.

CONCLUSIONS

Simple concepts involving conversion of units, calculations of molar mass and the Periodic Table using VBA have been demonstrated. The programs are quite easy to use and the instructions quite simple and straight forward. These programs can be modified to make it more attractive and other topics can be included to cover other areas of chemistry.

REFERENCES

E. J. Billo, (2001), Excel for Chemists 2nd. Ed., John Wiley and Sons.

P. G. MvKeown, (1999), Learning to program with Visual Basic, John Wiley and Sons

R. J. Sime, (2005), Physical Chemistry Calculations with Excel, Visual Basic for Applications, Pearson Education

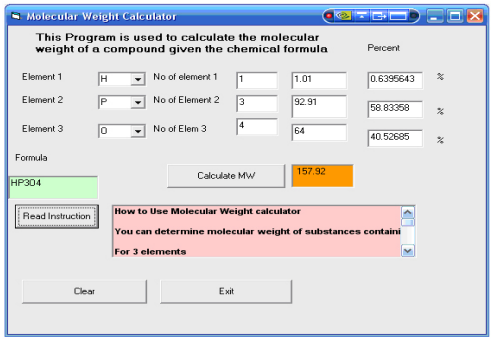


Figure 3: Results for the molecular weight of H3PO4

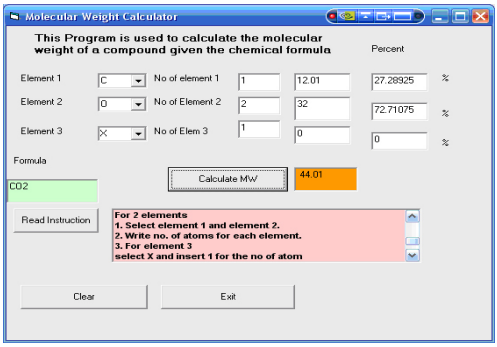


Figure 4: Results for CO2 (For two elements in the compound)

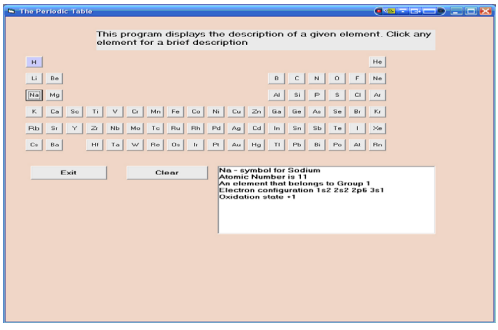


Figure 5: Information about sodium from the Periodic Table program

A PRELIMINARY STUDY OF COURSE INFORMATION ON I-LEARN PERSPECTIVE: FOCUSING ON ACCESSIBILITY, CONTENTS AND USER INTERFACE PARAMETERS

Mohd Nor Hajar Hasrol Jono, Azlan Abdul Aziz, Nurul Hidayah Mat Zain, Nor Adora Endut, Siti Rahayu Abdul Aziz, Prasanna a/p Ramakrisnan.
Universiti Teknologi MARA, Shah Alam, Malaysia
hasrol@tmsk.uitm.edu.my, azlanaa@tmsk.uitm.edu.my, nurulmz@tmsk.uitm.edu.my, adora@tmsk.uitm.edu.my, rahayu@tmsk.uitm.edu.my, prasanna@tmsk.uitm.edu.my

ABSTRACT

i-Learn serves as UiTM's Learning Management System (LMS) portal; launched by the i-Learn Center (i-LeC) in its aim to provide strategic adaptation of e-learning at the university. The portal includes, as one of its contents, the Course Information module useful as a guideline for lecturers as well as students to understand the structure and content of the courses or subjects being offered. This study aims at analyzing the characteristic effectiveness of the i-Learn portal particularly the Course Information Module focusing on aspects of accessibility, content and user interface parameters. The analysis was based on the results of questionnaires, taking UiTM's lecturers as the respondents. We measured whether the course information tool is useful in terms of speed and ease of use based on the Technology Acceptance Model (TAM). Finally, we present a brief discussion concerning the obtained results as well as future plans for utilizing the findings of this study.

1. INTRODUCTION

The i-Learn portal has been operating since December 30th 2005 in UiTM's quest to incorporate e-learning as an extended learning environment that supports, complements and enriches face-to-face classroom teaching and learning. The portal supports the online delivery of course information, content, assessment and discussion as well as useful resources of reference for lecturers and students alike. The Course Information tool is one of the key features available on the i-Learn portal. This tool is useful for communicating the course plans and expectations to the students. It also contains the course outline and syllabus of a particular course or subject.This is useful for establishing an early point of contact and connection between the students and the lecturer, assisting in setting the initial tone and expectation for the course and helping-students assess their readiness for the course. Grunert (1997) promotes a learning-centered approach in providing a course syllabus; which should include the purpose of the course, course description, course and unit objectives, resources, course calendar, course requirements, evaluation, grading procedures, content information, learning tools as well as how to study and use the-course syllabus. Altman and Cashin (1992) provides a more extensive suggestion on the main topics which should be included in the course syllabus, including attendance, class participation and academic honesty. They highlighted the belief that more experienced instructors usually include more material in their syllabus. The Course Information in the i-Learn portal has incorporated most of the items highlighted by Grunert and Altman et al. In particular, the course information provided by the portal consist of course description, credit unit, contact hour, code subject, subject name, assessment procedure, course objectives, preferred textbook and the references.Since its inception, there has yet to be any analysis on the effectiveness of the Course Information tool on the i-Learn portal. Thus, it is interesting to explore the viabilities of improving its features. We therefore embark on a study to measure the effectiveness of the Course Information tool specifically in terms of its content, accessibility and user-interface parameters.

2. EVALUATING EFFECTIVENESS

For the past several decades, studies have linked the success of a particular system with user attitudes; which is the relationship between a person and an object (Woelfel, 1995). The user attitude towards the Course Information tool on

the i-Learn portal can thus be used as a measurement for its effectiveness. Dillon and Morris (1996) defines user acceptance as the willingness within a user group to deploy information technology for the tasks it is designed to support. The Technology Acceptance Model (TAM) associates the users' perception of usefulness and ease-of use with their decision to use a particular novel software package (Davis, 1989). In this model, Perceived Usefulness is defined as "the degree to which a person believes that using a system would enhance his or her job performance"; reflecting the notion that effort is a finite resource that a person will allocate to various activities. Perceived Ease of Use is defined as "the degree to which a person believes that using a particular system would be free from effort". A review of scholarly research on information system (IS) acceptance and usage suggests that TAM has emerged as one of the most influential models in this stream of research. For this particular study, the external variables have been divided into three characteristics which are content, accessibility and user interface. All these variables provide a better understanding of what will influence Perceived Usefulness and Perceived Ease- of Use whereby their existence guide the action required influencing a greater use of the Course Information tool. Figure 1 illustrates the relationship of Perceived Usefulness and Perceived Ease of Use within the Technology Acceptance Model.

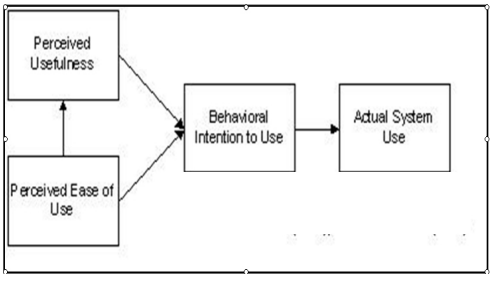


Figure 1: The Technology Acceptance Model (TAM) Source: Davis et al (1989)

2.1 Content

A survey on the literature highlighted that users focus more on the quality and content of a website than navigational or design issues (Morkes & Nielsen, 1997; Shum, 1996; Spool et al, 1997). In essence, good content is the key to an effective website, including an e-learning portal. We take into account the perceived ease-of-use and perceived usefulness in the measurement of effective content. Nielsen (1997) suggests the limitation of using full-page graphics and using easy-to-understand as some of the tips in creating effective website content taking into consideration the difference of user attitudes when reading online content as opposed to content in document forms.

2.2 Accessibility

Accessibility refers to the measurement of the degree to which a system is usable by as many people as possible. It can also be viewed as the ability to access the functionality of an information system (Bolichini & Yu, 2004). W3C published a specific set of guidelines for web design in order to ensure that web content is accessible for people of all abilities or disabilities. In other words, all users should have equal access to information and functionality. Web accessibility encompasses the visual, motor/mobility, auditory, seizures and cognitive/intellectual aspects of disability among web users. Hence, web content should be properly designed to cater to each of these aspects.

2.3 User Interface

Aesthetic and navigational factors complement accessibility in garnering the overall success of a product or system (Green and Jordan, 2001; De Angeli et al, 2006). We include the use of onscreen visual objects including menus, language, options, screen layout, commands as well as the relationship between the objects to encompass the user interface parameter in our analysis. The user interface design of the i-Learn portal should be evaluated in terms of its capability to engage users in fulfilling interaction, and generating affective responses in order to fulfill both the Perceived Usefulness and Perceived Ease of Use of the TAM.

3. METHODOLOGY

The purpose of this preliminary study was twofold. First, it serves as a quantitative measurement of the effectiveness of the Course Information tool on the i-Learn portal specifically in terms of its content, accessibility

and user interface parameters. Second, it provides the basis for the exploration of viability to improve and enhance the i-Learn portal.

Subjects of the study were 150 lecturers of the university randomly selected from 24 faculties and subjects were required to interact with the i-Learn portal over a 2-month period. The questionnaire was designed to contain four sections; Section A is concerned with the overall structure of the Course Information Module, Section B consists of questions concerning the Content, Section C concerns the Accessibility variable and finally Section D concerns the User Interface variable questions.

4. RESULTS AND FINDINGS

4.1 Course Information

Respondents were asked to answer questions concerning the overall Course Information tool in Section A.

4.1.1 The Importance of Course Information in Teaching

Figure 2 illustrates the results for the subjects' perception on the importance of the Course Information tool in the i-Learn portal.

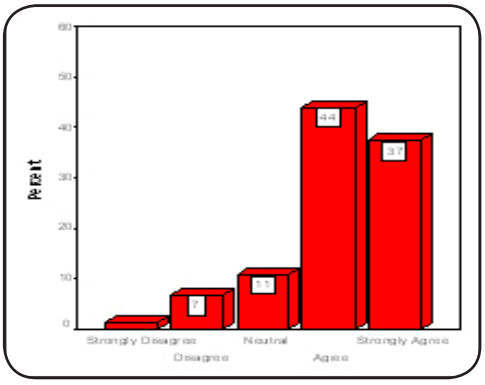


Figure 2: The Importance of Course Information for Teaching

4.1.2 The Course Information Module Provides Enough Information

Figure 3 shows the overall percentage of respondents' perception on whether the Course Information module provides enough information about a particular course.

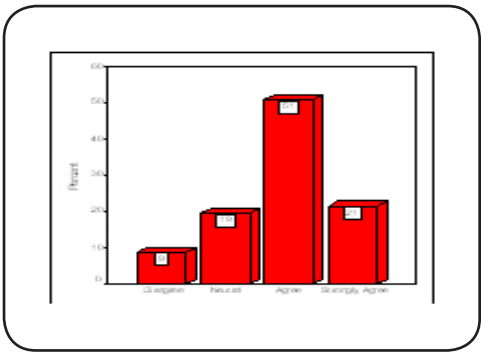


Figure 3: The Course Information Module Provides Enough Information

4.1.3 The Course Information Module is Useful

Figure 4 shows the overall percentage of respondents' perception on whether the Course Information module is useful.

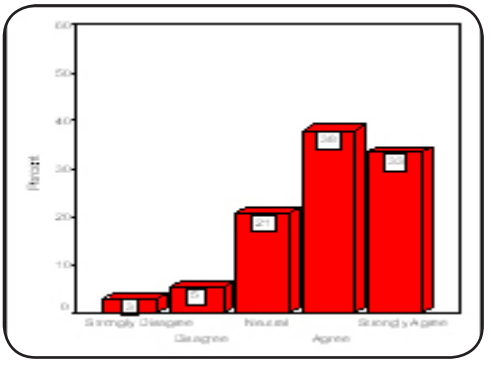


Figure 4: The Course Information Module is Useful

4.2 Content

Respondents were asked to answer questions concerning the Content variable in Section B.

4.2.1 The i-Learn Course Information Contents Build Motivation to Access the i-Learn Portal

Figure 5 shows the respondents' perception on the Course Information contents' perceived usefulness in building motivation to access the i-learn portal.

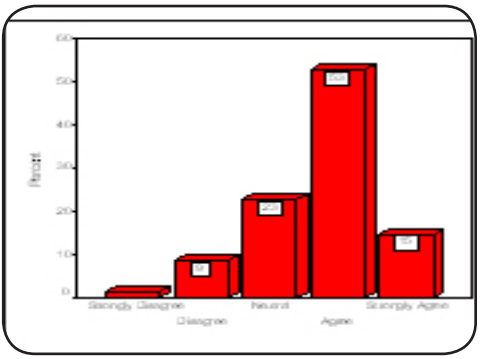


Figure 5: The i-Learn Course Information Contents Build Motivation to Access the i-Learn Portal

4.2.2 The i-Learn Course Information Contents Help Develop the Ability to Plan Work

Figure 6 shows the respondents' perception on the Course Information contents' perceived usefulness in building helping them develop the ability to plan work.

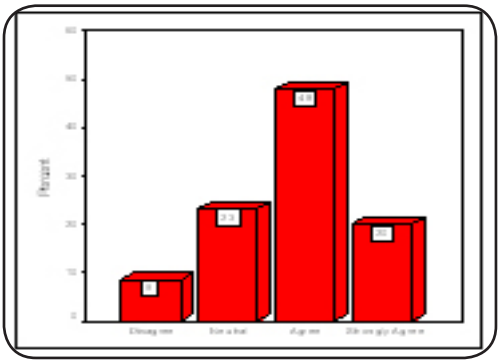


Figure 6: The i-Learn Course Information Contents Help Develop the Ability to Plan Work

4.2.3 The i-Learn Course Information Contents is Relevant

Figure 7 shows the respondents' perception on the relevance of the Course Information contents.

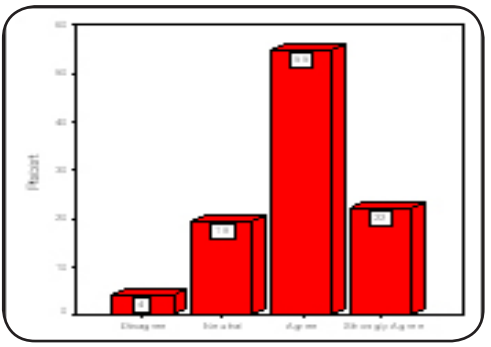


Figure 7: The i-Learn Course Information Content is Relevant

4.3 Accessibility

Respondents were asked to answer questions concerning the Accessibility variable in Section C.

4.3.1 I Frequently Access the Course Information Module

Figure 8 illustrates the respondents' answers concerning the frequency they access the Course Information Module on the i-Learn portal.

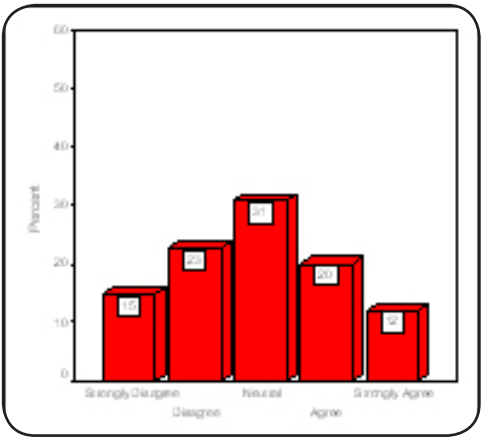


Figure 8: I Frequently Access the Course Information Module

4.3.2 There Was No Difficulty When Accessing the i-Learn Course Information Module

Figure 9 illustrates the respondents' perception on the difficulty experiences while accessing the Course Information module.

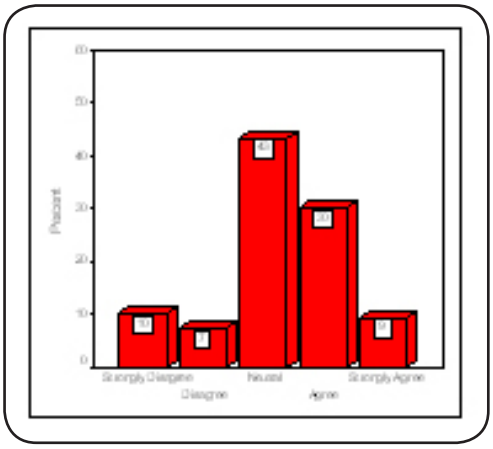


Figure 9: There Was No Difficulty When Accessing the i-Learn Course Information Module

4.4 User Interface

Respondents were asked to answer questions concerning the User Interface variable in Section D.

4.4.1 The i-Learn Course Information is Presented Clearly

Figure 10 shows the perception of the respondents on the presentation clarity of the Course Information module.

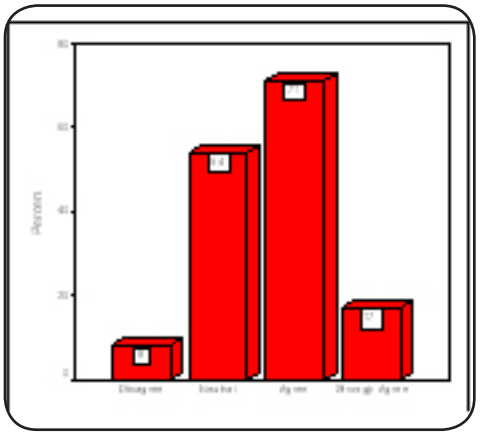


Figure 10: The i-Learn Course Information is Presented Clearly

4.4.2 The Background Color and Font Type is Appropriate

Figure 11 shows the respondents' view on the aesthetic value of the Course Information module.

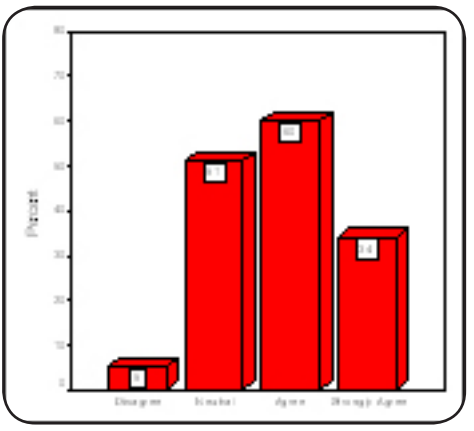


Figure 11: The Background Color and Font Type is Appropriate

5. CONCLUSION AND FUTURE WORK

The Learning Management System (LMS) portal initiated and launched by UiTM incorporates e-learning as an extended learning environment that supports, complements and enriches face-to-face classroom teaching and learning environment far from alienating the academicians. To fully serve the purpose of communicating the course plan, the expectations, and being early point of contact and connection between the students and the learners, it is imperative that the portal be evaluated on the very essence that it was intended to serve. From the study, most of the respondents found the course information sufficient and useful, the content helpful and relevant, less complication in the accessibility parameter, and the interface appealing and appropriate. These findings are merely indicators that UiTM's LMS is on the right track not proclaiming it as foolproof or complete. In the future, more studies can be carried out to look into the areas for further refinement and improvisation.

REFERENCES

Altman, H.B. and William E.C. 1992. Writing a Syllabus. In Idea Paper 27. Center for Faculty Evaluation and Development, Division of Continuing Education, Kansas Sate University

Bolchini, D. and Yu, E.S.K. 2004. Modelling User Requirements for Web Application Design. Journal of Communication Sciences. 4(2), 173-196.

Davis,F.D.1989.PerceivedUsefulness,Perceived Ease of Use, and User Acceptance of Information Technology. MIS Quarterly. 13(3), 319-340.

De Angeli, A., Sutcliffe, A. and Hartmann, J. 2006. Interaction, Usability and Aesthetics:What Influences Users' Preference? Proceedings of the 6th ACM Conference on Designing Interactive Systems.

Dillon, A. and Morris, M. 1996. User Acceptance of Information Technology; Theories and Models. Annual Review of Information Science and Technology. (p 3-32). Medford NJ. Information Today, Inc.,

Green, W.S. and Jordan, P.W. 2001. Pleasure with Products: Beyond Usability. Taylor & Francis, London.

Grunert, J. 1997. The Course Syllabus: A Learning-Centered Approach, Anker Publishing. Bolton, M.A.

Morkes, J. and Nielsen, J. 1997. Concise, SCANNABLE, and Objective: How to Write for the Web. Available online at http://www.useit.com/papers/webwriting/writing.html Accessed: May 16th, 2007

Nielsen, J. 1997. Be Succinct! (Writing for the Web). Available online at http://www.useit.com/alertbox/9703b.html Accessed: May 19th, 2007

Shum, S.B. 1996. Design Argumentation as Design Rationale. In Kent, A. & Williams, J.G. (Eds). The Encyclopedia of Computer Science and Technology. 95-128. Available online at http://kmi.open.ac.uk/people/sbs/docs/SBS-ECST-1996.pdf Accessed: May 19th, 2007

Spool, J.M., Scanlon, T., Schroeder, W., Snyder, C. andDeAngelo, T. 1997. Web Site Usability: A Designer's Guide. Morgan Kaufmann Publishers.

A PRELIMINARY STUDY OF TRAINING EFFECTIVENESS ON I-LEARN PORTAL AT UNIVERSITI TEKNOLOGI MARA (UiTM)

Mohd Nor Hajar Hasrol Jono, Janudin Sardi, Nurul Hidayah Mat Zain, Siti Rahayu Abdul Aziz, Azlan Abdul Aziz
Universiti Teknologi MARA, Shah Alam, Malaysia
hasrol@tmsk.uitm.edu.my, janudin@salam.uitm.edu.my,
nurulmz@tmsk.uitm.edu.my,rahayu@tmsk.uitm.edu.my,
azlanaa@tmsk.uitm.edu.my

ABSTRACT

Effective training ensures that lecturers use the tools and test equipment, documentation, and spare parts efficiently to provide the required system operational reliability, through the proper installation, operation and maintenance of the prime mission equipment (IALA/AISM, 2001). i-Learn Center (i-LeC) was established on the 30th of December 2005 and operated under the Academic Affairs Division (HEA). The center is responsible for handling adaptation of e-learning in UiTM and providing two parts of training for UiTM lecturers across faculties and campuses throughout the country. The first part is i-Learn Portal System Training that deals with hands-on training of the system. The second part is e-Note Training that focuses on the optimization in using Microsoft Office (MS Word, MS Power Point and MS Excel) and Macromedia Flash MX in teaching environments. Questionnaires to gauge the effectiveness of the training were distributed to the lecturers in training and the data analyzed. Thus in this study, we present the findings and the results obtained reflecting the response of the lecturers about the effectiveness of i-Learn Portal System Training and e-Note Training. Finally, we also discuss on the direction of the findings in this study.

1. INTRODUCTION

The continued need for individual and organizational development can be traced to numerous demands, including maintaining superiority in the market place, enhancing employee skills and knowledge, and increasing productivity. Training is one of the most pervasive methods for enhancing the productivity of individuals and communicating organizational goals to new personnel. Given the importance and potential impact of training on organizations and the costs associated with the development and implementation of training, it is important that both researchers and practitioners have a better understanding of the relationship between design and evaluation features and the effectiveness of training and development efforts. i-Learn is the name for UiTM *Learning Management System (LMS)* which is managed by the staff at the centre. Some of the tasks involve managing the system which includes entertaining queries via helpdesk, ensuring the system's stability, adding new users, integrating the system with other system in UiTM, and removing or adding remaining courses. The portal is accessible via internet where lecturers could access the system to create content and online collaboration with students. Students can also access the system from anywhere to download content and collaborate online. *i-Learn Content Development* is a platform which supports, enriches and upgrades the teaching and learning process. i-Learn centre is currently developing high quality courseware for students' use to optimize the acquisition of knowledge. At the moment, the uploaded courseware is still in its first phase of development. The information below shows the phases of courseware development that have been carefully planned in order to achieve its objectives. *i-Learn Portal System Training* is hands-on training about the system itself. The objectives of the training are to manage and upgrade existing course contents, to identify and develop high quality course content, to promote and encourage preparation of course content among lecturers and use by the students, and to ensure the technology and information sharing culture among lecturers and students through promotion and training. i-Learn Portal System Training also includes hands-on in course handling, question bank, question paper, scheduler,

forum moderation, assignment, e-mail and report. Course handling functions can be classified into the following sub-functions namely - define course outline, define course assessment, modify course attributes, announce course, announce course assessment and etc. Question bank functions can be classified into – new question creation, modify existing question attributes, remove question and search question in the question bank. Question paper functions can be classified into – new question paper creation, modify existing question paper attributes, remove question paper, search question in the question bank and assign marks for each question in the question paper. Scheduler functions can be classified into – new event creation, modify event attributes, remove event, new task creation and modify task attributes. Forum moderation functions can be classified into – post topics, post replies, approve / reject topics and approve / reject replies. Assignment functions can be classified into – new assignment creation modify existing assignment attributes and remove assignment. Email functions can be classified into – send mail to individual or all users, read incoming mails, reply mail and delete mail. Reports functions can be classified into – course reports and learner reports.

2. EVALUATING EFFECTIVENESS

Over the past 30 years, there have been six cumulative reviews of the training and development literature (Campbell, 1971; Gold-stein, 1980; Latham, 1988; Salas & Cannon-Bowers, 2001; Tannenbaum & Yukl, 1992; Wexley, 1984). On the basis of these and other pertinent literature, we identified several design and evaluation features that are related to the effectiveness of training and development programs. However, the scope of the present article is limited to those features over which trainers and researchers have a reasonable degree of control. Specifically, we focus on (a) training management and (b) course contents. The choice of evaluation criteria (i.e., the dependent measure used to operationally the effectiveness of training) is a primary decision that must be made when evaluating the effectiveness of training. Although newer approaches to, and models of, training evaluation have been proposed (e.g., Day, Arthur, & Gettman, 2001; Kraiger, Ford, & Salas, 1993), Kirkpatrick's (1959, 1976, 1996) four-level model of training evaluation and criteria contin¬ues to be the most popular (Salas & Canon-Bowers, 2001; Van Buren & Erskine, 2002). Reaction criteria, which are operationalized by using self-report measures, represent trainees' affective and attitudinal responses to the training program. However, there is very little reason to believe that how trainees feel about or whether they like a training pro¬gram tells researchers much, if anything, about (a) how much they learned from the program (learning criteria), (b) changes in their job-related behaviors or performance (behavioral criteria), or (c) the utility of the program to the organization (results criteria). This is supported by the lack of relationship between reaction criteria and the other three criteria (e.g., Alliger & Janak, 1989; Alliger, Tannenbaum, Bennett, Traver, & Shotland, 1997; Arthur, Tubre, Paul, & Edens, 2003; Colquitt, LePine, & Noe, 2000; Kaplan & Pascoe, 1977; Noe & Schmitt, 1986).

3. METHODOLOGY

The purpose of this preliminary study was threefold. First, it serves as a quantitative measurement of the effectiveness of i-Learn portal training towards lecturers in UiTM. Second, it identifies the necessity of giving continuous i-Learn portal training to lecturers. Third, it provides the basis for the exploration of viability to improve and enhance the quality of the i-Learn portal training. Subjects of the study were 400 lecturers of the university randomly selected from 24 faculties and subjects were required to attend the i-Learn portal training. The questionnaire was designed to contain two sections; Section A is concerned with the overall satisfaction of training management; Section B consists of questions concerning the effectiveness of training contents.

4. RESULTS AND FINDINGS

4.1 Training Management

Respondents were asked to answer questions concerning the overall satisfaction of training management in Section A.

4.1.1 Satisfaction on overall training program quality

Figure 1 illustrates the results for the subjects' perception on the quality level of training program.

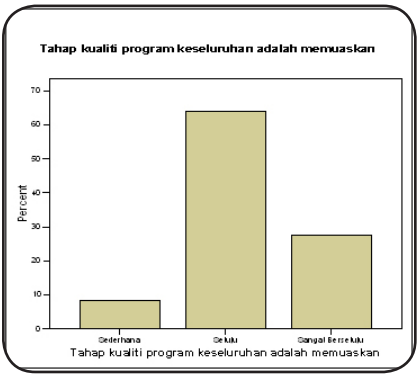


Figure 1: Satisfaction on overall training program quality

4.1.2 Duration of training is satisfactory

Figure 2 shows the overall percentage of respondents' perception on the duration of training.

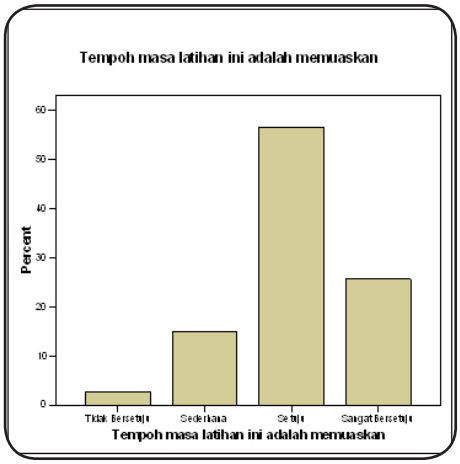


Figure 2: Duration of training is satisfactory

4.1.3 Continuous training is required

Figure 3 shows the overall percentage of respondents' perception on whether the training should be provided by i-Learn.

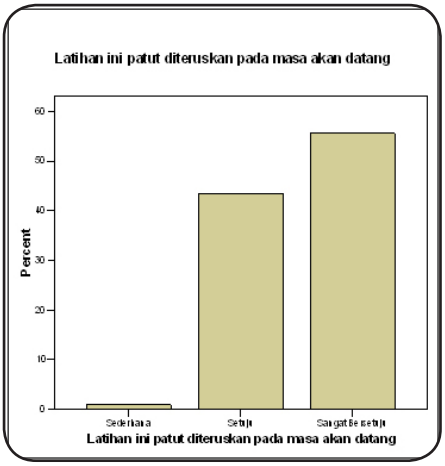


Figure 3: Continuous training is required

4.1.4 The Training Is Very Important For Learning E-Learning

Figure 4 shows the overall percentage of respondents' perception on the importance of training in learning process.

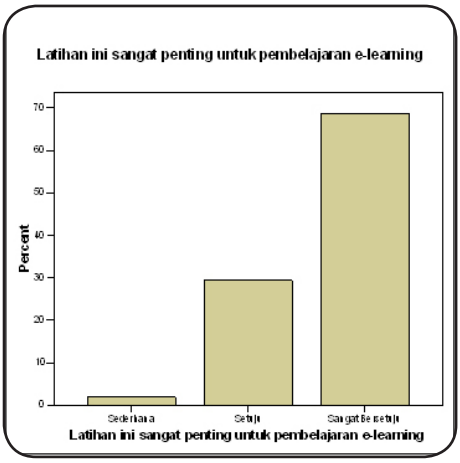


Figure 4: The Training Is Very Important For Learning E-Learning

4.1.5 Satisfaction on Training Program Promotion quality

Figure 5 shows the respondents' perception on the training promotion.

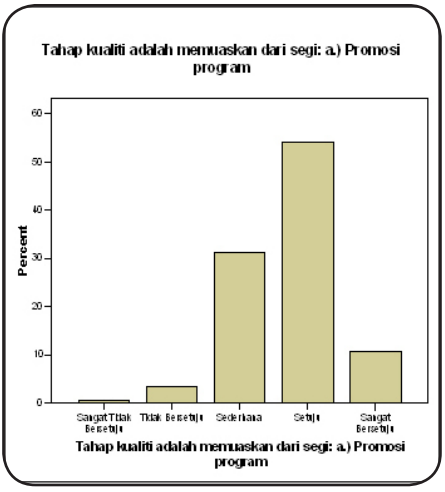


Figure 5: Satisfaction on Training Program Promotion quality

4.1.6 The Quality Level of Training Committee at Satisfactory Level

Figure 6 shows the respondents' perception on the quality level of training committee.

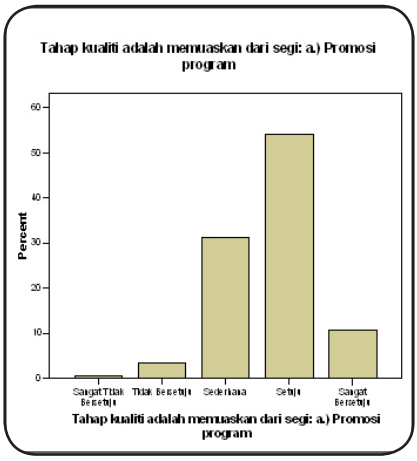


Figure 6: The Quality Level of Training Committee at Satisfactory Level

4.2 Training Contents

Respondents were asked to answer questions concerning the Training Contents variable in Section B.

4.2.1 The Trainee Can Implement LMS When Training is Provided

Figure 7 shows the respondents' perception on the implementation of LMS.

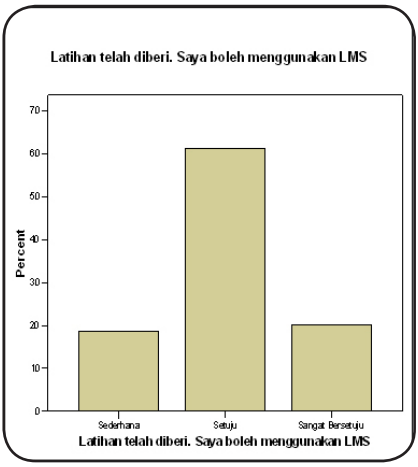


Figure 7: The Trainee Can Implement LMS When Training is Provided

4.2.2 The Trainee Can Implement e-Note When Training is Provided.

Figure 8 illustrates the respondents' answers concerning on the implementation of e-note.

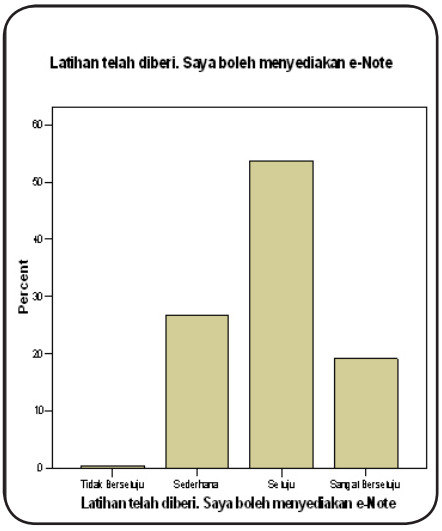


Figure 8: The Trainee Can Implement e-Note When Training is Provided.

4.2.3 The LMS Competency Level before Attending Training at Satisfactory Level

Figure 9 illustrates the respondents' perception on the level of usability LMS before attending training.

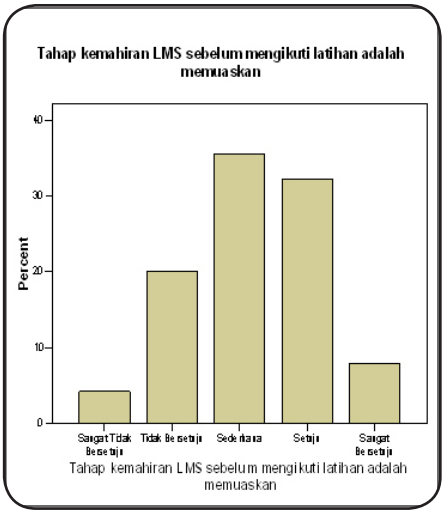


Figure 9: The LMS Competency before Attending Training at Satisfactory Level

4.2.4 The LMS Competency Level After Attending Training At Satisfactory Level

Figure 10 shows the perception of the respondents on the level of usability LMS after attending training.

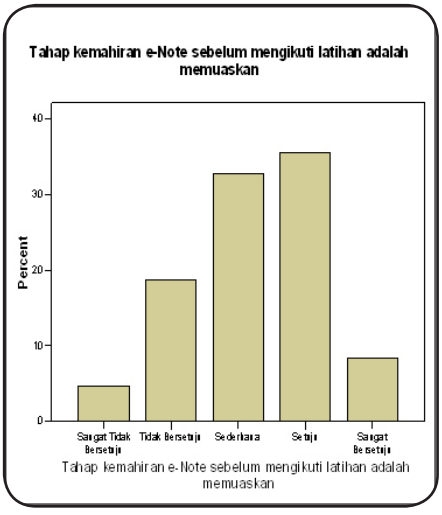


Figure 10: The LMS Competency Level After Attending Training At Satisfactory Level

4.2.5 The e-Note Competency Level Before Attending Training At Satisfactory Level

Figure 11 shows the perception of the respondents on the level of usability e-Note before attending training.

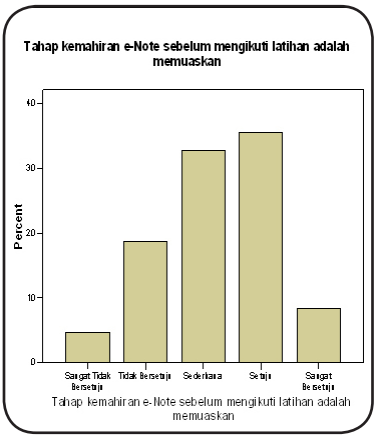


Figure 11: The e-Note Competency Level Before Attending Training At Satisfactory Level

4.2.6 The e-Note Competency Level After Attending Training At Satisfactory Level

Figure 12 shows the perception of the respondents on the level of usability e-Note after attending training.

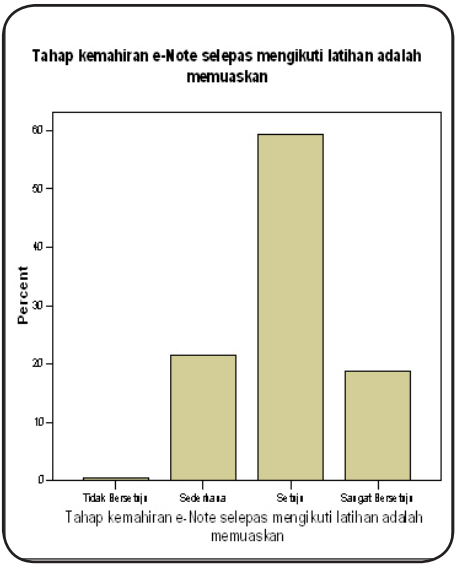


Figure 12: The e-Note Competency Level After Attending Training At Satisfactory Level

5. CONCLUSION AND FUTURE WORK

Continuous need for development that enhances employee skills, knowledge and increase productivity may come in the form of training. Training undoubtedly is one of the most pervasive methods for enhancing the productivity of individuals and therefore needs to be evaluated on its effectiveness. The evaluation indicated that respondents reacted positively on the program, its duration, and the training conducted. They also found that the hands-on training regarding the LMS and e-note were beneficial and worthwhile. However future study can look into the other two levels namely, the transfer learning, and results as outlined in the Kirkpatrick's four-level model of training evaluation to ensure the full effectiveness of the training program.

REFERENCES

Alliger, G. M., & Janak, E. A. (1989).Kirkpatrick's levels of training criteria: Thirty years later. Personnel Psychology, 41, 331–342.

Arthur, W., Jr., Tubre, T. C., Paul, D. S., & Edens, P. S. (in press). Teaching effectiveness: The relationship between reaction and learning criteria. Educational Psychology, 23, 275–285.

Birchall, D. & Smith, M. (1999). Technology supported learning. In A. Landale (Ed.),Gower Handbook of Training and Development. (3rd ed., pp. 354-362). Aldershot,England: Gower Publishing.

Campbell, J. P. (1971). Personnel training and development. Annual Review of Psychology, 22, 565–602 Cascio, W. F. (1991). Costing human resources: The financial impact of behavior in organizations (3rd ed.). Boston: PWS–Kent Publishing Co.

Cascio, W. F. (1998). Applied psychology in personnel management (5th ed.). Upper Saddle River, NJ: Prentice Hall.

Colquitt, J. A., LePine, J. A., & Noe, R. A. (2000). Toward an integrative theory of training motivation: A meta-analytic path analysis of 20 years of research. Journal of Applied Psychology, 85, 678–707.

Day, E. A., Arthur, W., Jr., & Gettman, D. (2001). Knowledge structures and the acquisition of a complex skill. Journal of Applied Psychology, 86, 1022–1033.

Facteau, J. D., Dobbins, G. H., Russell, J. E. A., Ladd, R. T., & Kudisch, J. D. (1995). The influence of general perceptions of the training environment on pretraining motivation and perceived training transfer. Journal of Management, 21, 1–25.

Farina, A. J., Jr., & Wheaton, G. R. (1973). Development of a taxonomy of human performance: The task-characteristics approach to performance prediction. JSAS Catalog of Selected Documents in Psychology, 3, 26–27 (Manuscript No. 323).

Gagne, R. M., Briggs, L. J., & Wagner, W. W. (1992). Principles of instructional design. New York: Harcourt Brace Jovanovich.

Goldstein, I. L., & Ford, J. K. (2002). Training in organizations: Needs assessment, development, and evaluation (4th ed.). Belmont, CA: Wadsworth.

Hart, L.B. (1991). Training Methods that Work: A Handbook for Trainers. Menlo Park, CA: Crisp Publications.

Kaplan, R. M., & Pascoe, G. C. (1977). Humorous lectures and humorous examples: Some effects upon comprehension and retention. Journal of Educational Psychology, 69, 61–65.

Kraiger, K., Ford, J. K., & Salas, E. (1993). Application of cognitive, skill-based, and affective theories of learning outcomes to new methods of training evaluation. Journal of Applied Psychology, 78, 311–328.

Kirkpatrick, D. L. (1959). Techniques for evaluating training programs. Journal of the American Society of Training and Development, 13, 3–9.

Kirkpatrick, D. L. (1976). Evaluation of training. In R. L. Craig (Ed.), Training and development handbook: A guide to human resource

development (2nd ed., pp. 301–319). New York: McGraw-Hill.

Kirkpatrick, D. L. (1996). Invited reaction: Reaction to Holton article. Human Resource Development Quarterly, 7, 23–25.

Latham, G. P. (1988). Human resource training and development. Annual Review of Psychology, 39, 545–582.

McGehee, W., & Thayer, P. W. (1961). Training in business and industry. New York: Wiley.

Noe, R. A., & Schmitt, N. M. (1986). The influence of trainee attitudes on training effectiveness: Test of a model. Personnel Psychology, 39, 497–523.

Quin˜ones, M. A. (1995). Pretraining context effects: Training assignment as feedback. Journal of Applied Psychology, 80, 226–238.

Quin˜ones, M. A., Ford, J. K., Sego, D. J., & Smith, E. M. (1995). The effects of individual and transfer environment characteristics on the opportunity to perform trained tasks. Training Research Journal, 1, 29–48.

Rasmussen, J. (1986). Information processing and human–machine interaction: An approach to cognitive engineering. New York: Elsevier.

Salas, E., & Cannon-Bowers, J. A. (2001). The science of training: A decade of progress. Annual Review of Psychology, 52, 471–499.

Schneider, W., & Shiffrin, R. M. (1977). Controlled and automatic human information processing: I. Detection, search, and attention. Psychological Review, 84, 1–66.

Sleezer, C. M. (1993). Training needs assessment at work: A dynamic process. Human Resource Development Quarterly, 4, 247–264.

Tannenbaum, S. I., Mathieu, J. E., Salas, E., & Cannon-Bowers, J. A. (1991). Meeting trainees' expectations: The influence of training fulfillment on the development of commitment, self-efficacy, and motivation. Journal of Applied Psychology, 76, 759–769.

Tannenbaum, S. I., & Yukl, G. (1992). Training and development in work organizations. Annual Review of Psychology, 43, 399–441.

Van Buren, M. E., & Erskine, W. (2002). The 2002 ASTD state of the industry report. Alexandria, VA: American Society of Training and Development.

Wexley, K. N. (1984). Personnel training. Annual Review of Psychology, 35, 519 –551.

Wexley, K. N., & Latham, G. P. (2002). Developing and training human resources in organizations (3rd ed.). Upper Saddle River, NJ: Prentice Hall

SATELLITE BASED INTERNET EDUCATION DELIVERY AND E-LEARNING OBJECTS EVALUATION: SOI ASIA AND CODEWITZ PERSPECTIVE

M. Saiful Islam (Institute of Information and Communication Technology, Bangladesh University of Engineering and Technology , Dhaka, Bangladesh, mdsaifulislam@iict.buet.ac.bd) and S. M. Lutful Kabir (Institute of Information and Communication Technology, Bangladesh University of Engineering and Technology, Dhaka, Bangladesh, lutfulkabir@iict.buet.ac.bd)

ABSTRACT

Development of Internet based distance education facilities and e-Learning objects development is commensurate with the capacity building and modernization process of Bangladesh University of Engineering and Technology (BUET) and congruent with the long term objective of the institution regarding facilitation of continuing education satisfying the temporal and spatial constraints. To fulfill the objectives, BUET has established satellite based School On the Internet (SOI) project and become active partner in the global e-Learning object development program through CodeWitz project. In this paper we present, (i) the technology used to deliver the real time lectures through SOI, (ii) the content and quality assessment of the delivered lecture by the participants and its overall impact in the human resource development in BUET, (iii) the development of e-Learning objects for different programming languages, and (iv) the quality evaluation of the developed objects and interest from other stakeholders of the CodeWitz project

1. INTRODUCTION

Today, Internet is a tool that empowers society to school the illiterate, bring job training to the unskilled, open universe of wondrous images and knowledge all the students and enrich the understanding of the lifelong learners (Saiful 2003). Internet based education is a form of distance education in which the course contents are delivered and the interaction are provided by the technologies and methodologies of the Internet. It may occur in places where there is none, extends resources where there are few, expends the learning day and opens the learning place. It is possible to connect people, communities and resources to support learning (Aggrawal 2000). The real revolution now taking place is not the hardware and of technology, but the intellectual technology of information, communication and augmentation of human intelligence.One of the toughest parts of Internet based education is creating effective contents/objects. Content that suits the learning style of users and relevant learning scenarios improve the success rate of an e-Learning initiative significantly. Content development plays a key role in e-Learning (Mitra 2000). Designing of contents/objects with good interactivity is essential for an effective teaching and learning system. Development of such interactive objects is not an easy task for instructors who lack technical knowledge. It requires a collaborative work among experts from various fields (Cornford, 2000).In this paper we try to address issues mainly related to Internet based education; like, content delivery mechanism via satellite based Internet infrastructure, the quality of delivered content through SOI network and the creation of quality e-Learning objects specially for programming languages in CodeWitz project that will ultimately enhance the learning capability of the students and teachers alike.

2. SATELLITE BASED INTERNET: SOI ASIA

Satellites are playing a key role in national or global infrastructures. Satellite-based Internet systems could play an important role in distance learning (DL). A satellite earth station can be installed anywhere on the ground as long it can receive satellite signal. Thus satellite based Internet can provide Internet environment in a less expensive way for the universities located where Internet environments are insufficiently developed. The broadcast capabilities of

satellite networks make them inherently multicast-enabled and as a result satellites have been, and continue to be, used for DL implementations. Using the multicast capability of satellites, SOI Asia project was launched Internet based DL in 2001 (Mikawa 2003), to contribute to higher education in Asian region by utilizing satellite based internet Infrastructure. SOI Asia used the Asian Internet Inter-connection Initiative (AI3) project network infrastructure using C-band satellite communication which gives a total 9 Mbps unidirectional receive only bandwidth to Asian regions. SOI Asia project utilizes satellite based Internet environments in a less expensive, easy to deploy and more feasible way for universities located in Asian regions and development of the necessary technology for IT human resource development in Asia while using the environments and try to establish a new distance educational methodology for universities in Japan as well as educational institutions abroad through field experiments.Depending on the activities SOI Asia designed 1) lecturer site, 2) gateway site and 3) student site. The overview of SOI environment is shown in Fig.1.

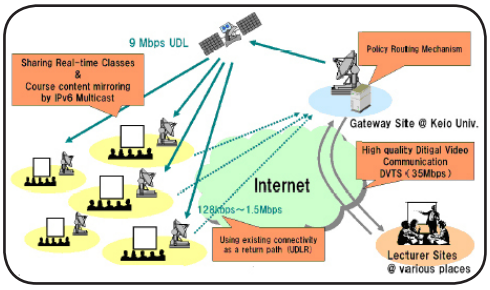


Figure 1: Overview of SOI Asia environment

The lecturer site can be built anywhere as long as it has sufficient bandwidth to carry lecture video and audio in good quality to the gateway site. There are 4 types of lecturer site application configurations according to the network bandwidth: 1) site over 100 Mbps connection to the gateway site, 2) sites over 1 Mbps connection to the gateway site, 3) sites with over 128 kbps connection to the gateway site, and 4) gateway site is the lecturer site. Mirror servers are located at the student sites for the students to the archived lectures, so that they don't have to connect to remote/overseas original server. From students' site, the lecturers gets the feedback by video, audio, character based communication, phone or fax. Each site chooses the way in which they would send the feedback from the student's site considering the most suitable mode in light of their existing terrestrial Internet infrastructure.At present, the gateway site is at KEIO University, Shonan Fujisawa Campus (SFC), Japan that has 1 Gbps connection to the Japanese network backbone and also has AI3 project's C-band satellite that can deliver Ethernet packets in 9 Mbps using UDLR (Uni Directional Link Routing, RFC 3077) technology. By using this environment the gateway is able to deliver good quality of video and audio to student site.

2.1 SOI Asia Project: IICT, BUET Perspective

Internet relay chat (IRC). Institute of Information and Communication Technology (IICT) of Bangladesh University of Engineering and Technology (BUE) aim to contribute to the Asian countries by sharing BUET professors' research results and also to enhance their own expertise by participating other university professors' cutting edge technology lecture, through e-Learning system of School On the Internet Asia project (SOI Asia). SOI Asia was launched in 2001 by WIDE Project (Tomomitsu 2001) and KEIO University. As of June 2007, the project has 25 partner universities and research institutes in 12 countries in Asia, and has deployed receive-only satellite earth stations at each partner site to share the distribution of live lectures from various part of the world as well as archived lectures. BUET has joined the SOI Asia in October 2004 and IICT is the SOI Asia BUET focal point.Since joining SOI Asia in October 2004, BUET has participated in the live lecture and shared various lecture contents provided by SOI Asia, such as Information Technology, Disaster Management and so on. From the beginning, BUET SOI Asia environment basically is a student site. For the first time (2007) BUET professors' also contribute to this project by delivering course contents, especially in field of renewable energy. Since the Internet connection from Bangladesh to the SOI Asia gateway, KEIO University (SFC), is not broad enough for real-time video and audio transmission. Therefore, for lecture broadcasting, BUET combines

1) archived contents broadcasting, and 2) real-time question and answer session by using dedicated 192 kbps for 30 to 40 minutes per lecture and become a lecturer site in a limited manner.

2.2 SOI Asia Project Content Delivery and Evaluation

To assess the quality of the delivered content and appropriateness of the offered courses (June 2006- May 2007) to the partner institutions SOI Asia provided a 'SOI Asia Lecture monitoring Sheet'. In BUET site, we conducted a survey using this questionnaire sheet among the par ticipants and results are summarized in Table 1. From the table we found that except the courses on advanced topics on marine sciences, all other offered courses evoked high interest among the faculty members of different departments and as well as postgraduate students.Still, the participants of the courses felt inconvenience during the question answer session, because this session did not have the facility of video and communication between the lecturer and students mostly by audio and character based facility through

Table 1

SI no.	Course title	Target audience	No. of participant	Level of lecture	How was the main topic?	Use of archire lecture	Reason for non-participation
1.	Advance topics for marine science	Nil	0	0	0	0	No marine Science Depart. in BUJET
2.	Tsunami phenomena and disaster	Faculty member	10	Easy	Very interested	Quite often	N/A
3.	Advance topics for marine tech. & logistics	Nil	0	0	0	0	No marine Science Depart. in BUJET
4.	Earthquakes and their disaster reduction	Faculty member	12	Easy	Interested	Sometime	N/A
5.	Advance Internet technology - III: Wireless network and mobile systems	Postgraduate	25	Appro-priate	Interested	Quite often	N/A
6.	Object oriented software development	Postgraduate	25	Easy	Very interested	Sometime	N/A
7.	Metropolitan wireless mesh networks	Postgraduate	18	Difficult	Interested	Not at all	N/A
8.	Emergency care and long term recovery process	Faculty member	11	Easy	Interested	Quite often	N/A

3. E-LEARNING OBJECTS AND CODE-WITZ PROJECT

E-learning, including both purely Internet web-based training and hybrid, or blended learning that combines web-based and traditional approaches is growing faster than any other sector of post-secondary and professional education. Students like accessibility of virtual classrooms. Employers love savings they can take to the bank. Many training companies have certain apprehension, however, worried about potential cannibalization of existing business. This is a legitimate concern. Nevertheless experience shows that fears of cannibalization do not materialize when e-Learning is taken as opportunities to both expands the reach and convert learning into truly year-round experience. This makes e-Learning a valuable part of class offering for increasing number of training companies and educational institutions (Kerry 2004, Pulichino 2003). One of the toughest parts of e-Learning is the development of effective contents or objects. Contents/objects that suit the learning style of users and relevant learning scenarios improve the success rate of an e-Learning initiative significantly. It is important for contents/objects to adhere to the objectives of the program and be powerful enough to engage the user. As e-Learning has become more widely used, the use of online content for learning has risen. However, much online content typically delivers low level outcomes and thereby produces a mismatch between outcomes derived in the face to face setting to those derived online. Development of e-Learning objects that matches intended outcomes and delivers the requisite cognitive load requires careful planning and structured development. IICT, BUET in September 2004 enter an agreement with Asia-Link programme of EU named Code-Witz project comprising 4 universities spanning from Asia and Europe. These universities are BUET, Shahjalal University of Science and Technology (SUST) of Bangladesh, Tempere University of Technology, Finland and

University of Applied Sciences, Berlin, Germany.

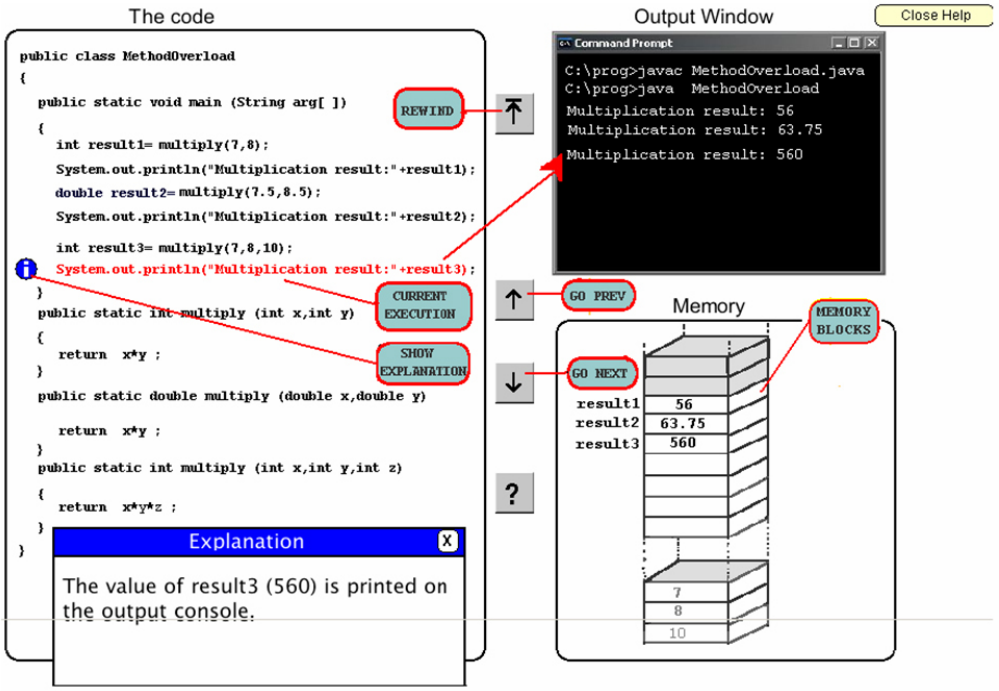


Figure 2: A typical e-Learning developed object (concept of method overloading in Java)

3.1 Features of e-Learning Objects

A learning object can be almost anything. Any stand alone piece of information capable of teaching something can be a learning object. It can be a chapter in a book, a video, an image, a wiring diagram, as interactive application, a simulation and so on. As well being of a flexible type, a learning object can be any size. A learning object should be a self-contained, reusable, smaller unit of learning that can be aggregated with other learning objects to produce more substantial units of learning. They are generally tagged with meta-data to allow them to be easily retrieved by a search. Each learning object should be developed such that it is self-contained so that it can be used without depending on other learning objects. These learning objects can be reused by the other courses that need to convey the same concept rather than requiring development of their own description. This can save both the time and the expense. The availability of computational power and network infrastructure that greatly facilitate distribution and sharing of learning objects coupled with their flexibility and re-usability creates a compelling economic rationale for e-Learning objects. In order to make such a system distributed and interoperable, we need to ensure that there is a common language that different systems understand and communicate. Extensible Markup Language, or XML, developed by the World Wide Web Consortium seems like the obvious solution for its two main reasons. First, it is structured so it is capable of representing an object hierarchy. Second, it is in plain text and easily machine-readable. Thus, it provides a means of distributing content to other systems no matter where they are located and no matter what program they are running. Thus, a piece of learning material, no matter where it is located, may be seamlessly integrated into an online course, provided the XML tags are employed consistently.

3.2 e-Learning Objects of CodeWitz Project

BUET as a partner university of CodeWitz project, we have developed more than 100 e-Learning objects in the area of C/C++, Java and

embedded system programming. In addition, we also developed some learning objects on data structure, algorithm and operating system as well. We have selected the most complex and critical topics for e-Learning object development. Fig.2 shows the snapshot of a developed e-Learning object in Java programming language for method overloading. The developed e-Learning objects are interactive and in some cases we incorporated animation for clear understanding. To ensure the quality, these objects are evaluated by a group of expert and with a brain storming environment. After accommodating the observations, the objects are uploaded to CodeWitz material bank (CMB). The uploaded objects in the CMB from each partner university are evaluated by other partner universities and system keeps the record of all comments, commendations and suggestions. In the bi-annual meeting of CodeWitz project observations on different e-Learning objects are discussed in detail and fix the date to address the shortcomings of the uploaded objects.

4. DISTANCE/E-LEARNING ENVIRONMENT AT BUET

Development of e-Learning/distance e-Learning facilities is consistent with the capacity building and modernization process of BUET and tuned with the long term objective of the university and also towards the fulfillment global trend in advanced education. Considering all these factors, in October 2004, BUET established the satellite based school on Internet (SOI) with the active cooperation of SOI Asia Project of Japan which is a totally advanced distance e-Learning facility. From its inception, lot of short courses and lectures on special topics were attended by the faculty members of different departments/institutes and postgraduate students. By attending these specialized courses they were immensely benefited. This year (2007) BUET faculty members also participated as a resource person of SOI Asia and as a result BUET become a member of the lecturer site. To run the daily activities of the BUET SOI site, human resource development is also important and SOI Asia There is no alternative of quality contents/ objects to make the web-based e-Learning more interesting. Without quality contents the objectives of e-Learning will not be materialized. Keeping this in mind, IICT, BUET joined the CodeWitz project in September 2004 which is aided by the Asia-Link programme of EU. Through this project we have developed e-Learning objects in different courses of information and communication technology and particular emphasis was given on programming languages. By utilizing these objects the undergraduate students and teachers of BUET will be highly benefited in terms of learning time and comprehension. Thus, working with these two projects BUET is establishing a pedagogical base for the effective and diverse use of Internet learning.

5. CONCLUSIONS

Internet is changing the very structure of society. The question is no longer if the Internet can not be used to transform learning in new and powerful ways, nor is the question should we invest the time, the energy and the money necessary to fulfill its promise in defining and shaping new learning opportunity. Our ability to use the Internet to reshape education and learning requires actions that also interrelated and interconnected. In this paper, we have discussed the two important avenues and their implementation i.e., satellite based Internet distance education and e-Learning object development for Internet based learning. Still, there are many other related issues to be addressed to reap the full potential of Internet and to make it available for all. Thus, through the successful implementation of the above mentioned projects IICT, BUET is gaining experience and will be able develop sustainable e-Learning model for Bangladesh in future.

6. ACKNOWLEDGEMENT

This research work has been carried out as part of the Asia-Link programme of EU CodeWitz project. The authors also gratefully acknowledge the contribution of SOI/AI3 Asia Project of Japan in establishing the SOI at IICT,

REFERENCES

Aggrawal, A. K, Bento R., 2000. Web-based Learning and Teaching Technologies: Opportunities and Challenges, Idea group publications, New Delhi, India

Cornford, J, 2000. The Virtual University is...the University Made Concrete? Information, communication and society, vol. 3, no.4, pp. 508-525.

Keichi, K, Keiko, O, Murai, J, 1999. Practical experiences of higher education on the Internet – cases from school on Internet, Proceedings of the ICCC, 1999, Tokyo

Kerry, B, Mason, J, McLean, N, Wilson, S, 2004. Trends and Issues in E-learning Infrastructure Development

Lee, J, and Dziuban, C, 2002. Using Quality Assurance Strategies for Online Programs, Educational technology review, vol.10, no. 2, pp. 69-78.

Mikawa, S, Keiko, O, Murai, J, 2003. Establishment of a lecture environment using Internet technology over satellite communication in Asian countries, SAINT 2003 workshop

Mitra, S, 2002. Research and Development Issues in Internet Based Education, Center for Research in Cognitive Systems, Synergy building, IIT Delhi-10016

Pulichino, J, 2003. Current Trends in e-Learning, Research Report

Saiful, S. I, 2003. Prospects and challenges of Internet based education and research, Proc. of international workshop on distributed Internet infrastructure for education and research (IWIER 2003), Dhaka, Bangladesh, pp.36-41.

Tomomitsu, B, et. al.2001. AI3 satellite Internet infrastructure and the deployment in Asia, IEICE transactions on communications, vol. E84-B, no. 8, pp. 2048-2057

E-CONTENT DEVELOPMENT: INDIAN INITIATIVES

Dr. S. Senthilnathan (Lecturer, Department of Educational Technology,
Bharathidasan University, Tiruchirappalli – 620 023, Tamilnadu, India.)

ABSTRACT

Ever since the buzz letter 'e' got tagged to the word 'learning', the world of education has witnessed a plethora of ICT initiatives with varying degrees of success. Thanks to the far-sighted approach that India followed in the field of Information Technology, world's best information technologists are available in the country and state-of-the-art facilities in terms of technologies and infrastructure, comparable with the most advanced countries are available to Indian teachers and students. E-content development is a major task before the teachers and content developers and the need for the same is more pronounced in India to provide quality education to 8.8 million students in 348 universities and 17,695 colleges across the country. In this regard, the Indian subcontinent has witnessed a considerable number of efforts to create e-content as well as to build the capacity of the teaching community for content creation. The most important ones are the efforts of the Consortium for Educational Communication of the University Grants Commission through the 17 Educational Multimedia Research Centres and the National Programme on Technology Enabled Learning through the Indian Institutes of Technology. This paper attempts to provide an account of these initiatives against the backdrop of India's fast expanding IT infrastructure and the current e-readiness.

1. INTRODUCTION

The developments in Information and Communication Technology (ICT) that have been taking place during the last two decades have led to a metamorphosis of processes and practices in almost all spheres of human endeavour. New Information and Communication Technologies have revolutionized the nature and pace of human interaction across the world which is increasingly assuming the contours of a 'global village'. ICTs can empower individuals and communities to interact and access knowledge locally and globally, thus empower them to learn, build capacity, drive and integrate development activities and adapt over time. ICT plays three fundamental roles: first, as an infrastructure for accessing information and sharing knowledge at any time from anywhere and at low cost; second, as a disruptive and transformative technology that is reshaping all types of processes and sectors of modern and traditional economies; and third, as an infrastructure for connecting people and enabling stakeholders to communicate and organise as well as access timely and relevant information and thus empower them to have voice, build capacity. learn and act. 'Information society' and 'knowledge economy' are the visions of what is possible or enabled by ICT. Other equally relevant terms may be connected economy and learning society. The challenge has been and is how to operationalise these visions. The unprecedented advances in the field of ICT have impacted the field of education more than any other field. "Rapid advances in Information and Communication Technology have created unprecedented opportunities in the field of education and have had a profound effect on the way teachers teach and how learners learn. Mastering ICT skills and utilising ICT towards creating an improved teaching and learning environment is of utmost importance to teachers in creating a new learning culture" (Molly Lee 2005). With the speed at which technology is changing the world, it is impossible to imagine education in the year 2020 not being immersed in technology. As the new millennium unfolds itself, most people are by now aware that we are in the midst of one of the most dramatic technological revolutions in history that is changing everything, the way in which we work, communicate, transact business, spend our leisure time and what not. The technological revolution centres on computer, information, communication and multimedia technologies, is often interpreted as the beginnings of a knowledge or information society, and therefore ascribes education a central role in every aspect of

life. This great transformation poses tremendous challenges to educators to rethink their basic tenets, to deploy the media in creative and productive ways, and to restructure education to respond constructively and progressively to the technological and social changes that we are now experiencing, as "teachers are the central forces in tapping the learning opportunities created by ICT" (Majumdar 2004).

2. THE REVOLUTIONIZED EDUCATION SCENE IN INDIA: FROM GURUKULA TO EGURUKUL

In recent years, the US, Japan and many of the European nations have become information societies, described as countries in which information workers are more numerous than such occupational categories as farmers, industrial workers, or service workers. India as a nation is still far from becoming an information society with 25 percent of workers in service occupations, 60 percent of them in farming and 15 percent in factories. However, of those in the service occupations, tens of millions are information workers. India has more information workers than Japan, and about the same number as the US. Thus, India has an information society within this nation of approximately one billion people. India is making remarkable progress towards development through the informatization strategy, the process through which communication technologies are used as a means of furthering socio-economic development. There will be more than one billion personal computers in use worldwide by the end of 2008 according to a new report `Worldwide PC adoption forecast 2007 to 2015' from Forrester Research. The report added that while it took 27 years for first billion PCs, the next billion is likely to come within next five years. The emerging Brazil, Russia, India, and China (BRIC) market will account for more than 775 million new PCs by 2015. India's Internet population is expected to cross 100 million by 2007-08, up from 38.5 million in 2005-06. The recent Nasscom-McKinsey report has predicted that India can build a $17-billion web-enabled industry by 2008.Some time between 2008 and 2010, annual export revenues from India's information technology (IT) sector are predicted to hit $50 billion. The revenue earned worldwide from e-learning was $6 billion in 2003 which is expected to rise to $21 billion by 2008. Nasscom reports that Indian companies would get revenues of $7 million to $9 million by end-2005. Given India's strengths in the ICT and software sectors, an array of innovations and experiments are underway for utilizing these tools and technologies to overcome educational challenges. A high-powered IT Task Force was set up in 1998 to break India's shackles and make her "a Global IT Superpower and a front-runner in the age of Information Revolution". It formulated India's National Informatics Policy. The Task Force's first report, IT Action Plan, consisting of 108 recommendations suggests "revisions and additions to the existing policy and procedures for removing bottlenecks and achieving a pre-eminent status for India". The second report, referred to as a Basic Background Report on IT Hardware Development, Production and Export calls for a paradigm shift in the IT hardware industry so that it "can survive the future shock of fast changing prices, technological obsolescence and an ever-expanding horizon of highly innovative industry" in order to make India the "number one provider of IT products" in the world. The report IT Action Plan has a section on operation knowledge, consisting of 29 recommendations. Recognising that IT is a "frontier area of knowledge and a critical tool for assimilating, processing and productivising all other spheres of knowledge", it calls for a national campaign for universal computer literacy. The report talks about strengthening IT programs in various universities and about starting SMART schools in each State. A provision for INR 502 crores has been made for the National Mission for Education through ICT under which all institutions of higher learning would be networked through broadband connectivity. A substantial proportion of this money would be used to network institutions of higher educations and research and for developing e-content. E-content would be developed and made available through the Internet, Cable TV networks and Direct-to-Home (DTH) systems. The University grants Commission (UGC) had been given a Plan Budget of 1269 crore in 2006-07, itself a substantial increase of over 68% over 2005-06 allocations. As one of the largest higher education systems in the

world with 8.8 million students in 348 universities and 17,695 colleges across the country, the Indian higher education system stands well poised and digitally empowered for phenomenal growth in every sphere of its functioning. The ICT initiatives in the arena of Indian education are taking new shapes, thanks to the launch of Edusat, India's first thematic satellite dedicated exclusively for education. With the successful launch of Edusat on 20th September 2004, the Indian sub-continent earned a unique position among the countries of the world as the only nation with an exclusive satellite dedicated for education. Edusat will contribute to the dream of 'educating the nation' through its different modalities, besides providing 72 television channels for satellite based education. Higher education and school education would be allocated 28 channels each and the remaining would be for health, culture, women's development etc. Facilitated by Edusat, Gyan Darshan, the exclusive 24 hour educational television channel now stands expanded into a bouquet of channels namely Gyan Darshan – 1 (for education and distance education), Gyan Darshan –2 (for interactive distance education), Gyan Darshan – 3 (Ekalvya - for engineering education) and Gyan Darshan – 4 (Vyas - for higher education). A whole host of digital services are also in the offing from Edusat.

3. E-LEARNING AND E-CONTENT DEVELOPMENT

The digital revolution has brought basic changes in the way of the literate Indians' thinking, behaving, communication, working and earning livelihood. The new ways to create knowledge, educate people, and disseminate information are most important products of this revolution. The term e-Learning covers a wide set of applications and processes including computer-based learning, web-based learning, virtual classrooms and digital collaboration. e-Learning is defined as the delivery of content through electronic media, be it Internet, intranet, satellite broadcast, audio/video tape, interactive TV and CD-ROM. It has emerged as a powerful supplement to conventional teaching learning systems. It uses the powerful multimedia and interactivity features of currently available computing platforms to deliver learning. The growth of World Wide Web and Internet, high-capacity networks through satellite and fibre optics, and high -speed desktop computers is making learning available round the clock around the globe. No wonder, e-learning is increasingly gaining widespread acceptance among students and faculty of India. When implemented correctly, e-learning builds on the unique, dynamic characteristics of digital content to foster productive and engaging learning. When integrated effectively into the curriculum by skilled teachers, digital content enables students to seek and manipulate digital information in collaborative, creative and engaging ways that make e-learning possible. An essential condition for effective ICT enabled teaching and learning is that there must be access to high quality, culturally relevant content. In the process of developing a techno-pedagogy for the 'new' learner in the 'new'environment, learning 'new' things using 'new' technologies, the first issue to be addressed is the development of content by teachers. The point of paramount importance is the fact that if teachers don't create e-content, either no one else can or somebody else will, of course with all possible shortcomings in terms of subject expertise and pedagogy. At the same time, the task of developing e-content or Knowledge Packaging necessitates collaborative efforts by technologists and academics. In this context, the following observation of Vladimir Kinelev (2005) needs attention, "ICTs have not eliminated the most pressing of problems that education systems face. Attempts to improve education through ICTs suffer from the absence of sound education paradigms". It is here that the teacher with clarity in content and depth in pedagogy assumes a pivotal role in creating the right instructional design and in creating appropriate content in effective manner. Indeed, Knowledge Packaging has always been there in India since the Gurukula days in different forms like conversations, lectures, songs, stories, manuscripts, print, audio and what not. Now, the need for digital convergence of these forms is imperative to provide high quality education to greater quantities of learners (approximately 360 million in the 18-32 age group) for the reason that the reach and richness of e-content is quite high. Other salient features of e-content viz., multi sensory learning

experience, digital convergence of text, image, audio, video, animation etc. to create the effects of multimedia, interactivity, relevance, authenticity, accessibility, reusability, interoperability etc. are also equally important points in favour of the claim to give top priority to e-content development, among all academic endeavours. Responding to the need, the Government of India has initiated concerted efforts for electronic content creation through a variety of agencies and schemes. The most notable efforts have been led by Consortium for Educational Communication (CEC), an Inter University Centre of the University Grants Commission (UGC) and National Programme on Technology Enabled Learning (NPTEL).

4. CONSORTIUM FOR EDUCATIONAL COMMUNICATION (CEC)

The University Grants Commission, the apex body of the Indian higher education system, as early in 1984 took the initiative to package knowledge in video form and make it available to teachers and students to supplement face to face teaching and learning. It also set up institutional mechanism for development of video based educational programmes. The institutional mechanism comprised Educational Media Research Centres (EMRCs) and Audio Visual Research Centres (AVRCs), located in 17 universities in different regions. In due course, Consortium for Educational Communication (CEC) was established as an Inter University Centre of the UGC, for coordinating all the Educational Media Research Centres (EMRCs) and Audio Visual Research Centres (AVRCs). As a Coordination Centre, the CEC has a huge video library of syllabus-based programmes, enrichment programmes and question-answer programmes on a variety of subjects. Every year, it keeps adding a minimum of 200 programmes and all the programmes are made available round the clock on Vyas – the 24 hour Higher Education Television Channel. Keeping in view the developments in ICT, the Educational Media Research Centres (EMRCs) and Audio Visual Research Centres (AVRCs), located in 17 universities in different regions were converted into Educational Multimedia Research Centres (EMMRCs) during the 10th Five Year plan. This is considered a major futuristic inititaive taken by the UGC for creating web-based learning resources or e-content. All the EMMRCs have been provided with necessary platform and technology for e-content development and the CEC conducts Capacity Development training programmes for teachers in two modes, one on-site (at New Delhi) and the other in remote sites through seamless videoconferencing using the Edusat network. The UGC provides funding through several schemes for higher education teachers for e-content development. The CEC packages knowledge resources as

- UGC Model Curriculum based educa tional programmes
- Syllabus based programme pertaining to subjects, relevant for undergraduate and postgraduate students
- Short-duration Reusable Learning Ob jects for the use by teachers for face to face teaching and learning

The content creation is done in any of the following formats:

- Assembled e-content
- Short Course/ Unit/ Module
- Full Courseware
- Short Reusable Learning Objects

The CEC accepts on-line proposals from higher education teachers for syllabus based or enrichment type e-content development in any of the above given formats on any subject and provides funding to them for the same. The content developers are provided with necessary training and technical support at the EMMRCs. The future plans of the CEC include providing educational video programmes in streaming format through UGC-INFONET, UGC's nation wide communication network and converting the existing educational video programmes to digital format with necessary multimedia inputs to be provided on Video-on-Demand mode. The CEC has a Learning Object Repository (LOR) and in addition has collaborated with Commonwealth of Learning for mutually sharing its Reusable Learning Object Repository with that of a Canadian Learning Object Repository, EduSource.

5. NATIONAL PROGRAMME ON TECHNOLOGY ENABLED LEARNING (NPTEL)

The National Programme on Technology Enhanced Learning (NPTEL), a project funded by the Ministry of Human Resource Development (MHRD) was first conceived in 1999 to pave the way for introducing multimedia and web technology to enhance learning of basic science and engineering concepts. Significant infrastructure has been set up earlier for production of video-based teaching material by the Indian Institutes of Technology (IITs) and Technical Teacher Training Institutes (TTTIs). In the current project (Phase I), seven IITs and the Indian Institute of Science (IISc) have been working together to develop web and video based material for basic undergraduate science and engineering courses in order to enhance the reach and quality of technical education in the country.Technology enhanced learning initiative involving IITs and Indian Institutes of Management (IIMs) was first proposed by IIT Madras in the year 1999, immediately following a Workshop on Technology Enhanced Learning (WoTEL) conducted in Chennai in collaboration with Carnegie Mellon University (CMU), Pittsburgh, USA. The vast experience of CMU in setting up a successful virtual university in Mexico was useful in drawing up the initial proposal which envisaged four initiatives, namely providing distance education, developing interactive and electronic resources for core courses for undergraduates, conducting joint Ph. D. programmes and setting up a digital library focused on the role of technology in knowledge accumulation, storing and disseminating content for education in three sectors: university, industry and government. A formal Memorandum of Understanding (MoU) between five IITs, four IIMs and CMU established a Virtual Centre for Technology Enhanced Learning (VCTEL). It was the first initiative in which all IITs and IIMs shared a common vision and proposed to work together to improve the quality of science, engineering and management education all across the country by offering courses through VCTEL. This proposal was submitted to MHRD in 1999 and revised several times. The Ministry of Human Resource Development, Government of India considered a modified proposal favorably and approved funding of INR 20.5 crores (205 million) of Indian Rupees in Phase I for three years from June 2003 till June 2006. The programme by extension has come to an end in June 2007 with a total output of 225 video and web based courses in undergraduate science and engineering disciplines. In order to facilitate the distribution of course material, two modes of operation have been suggested, namely, digital video lectures of courses and web based courses. The video programmes will be made available to the engineering college students through Ekalvya – the the 24 hour Higher Education Television Channel too.

6. CONCLUSION

Indian education has always attempted to keep itself ever new. Indian educational researchers have always been quick to apply, test, modify and make the best use of technologies that emerged form time to time. From the launch of Satellite Institutional Television Experiment by Vikram Sarabhai in1980s to the fresh aspiration of Vijay Bhatkar, the architect of Param series of supercomputers to provide Education-to-Home (ETH), Indian educationists and technologists have always had lofty dreams of which many have come true. “India can become one of the developed countries in the world by 2020, if we adopt technology as our tool. For this, the teaching community should enthuse the students by means of technology” (Abdul Kalam 2004).

REFERENCES

Aravind Singhal and Emerett M. Rogers, 2001. *India’s Communication Revolution, Sage Publications*. New Delhi.

Madhu Parhar, 2006. *Satellite in Education*, Shirpa Publications. New Delhi.

Majumdar (Ed.), 2005. *Regional Guidelines on Teacher Development for Pedagogy* – Technology Integration, UNESCO Asia and Pacific Regional Bureau for Education, Bangkok.

Rest, P., (Ed.,), 2002. *Information and Communication Technologies in Teacher Education: A Planning Guide*, UNESCO. Paris.

Shirley et al., 2000. *Teaching with Learning Technology,* Napier University. Edinburgh.

Singh and Sandhir Sharma, 2005. *E-Learning-New Trends and Innovations, Deep & Deep Publications*. New Delhi

CREATING THE FUTURE OF NURSING EDUCATION IN MALAYSIA:ENVISIONING THE EVOLUTION OF E-NURSING EDUCATION IN MALAYSIA

Mr. Nanthakumaran s/o Manickam (Deputy Director, Department of Health, Johor); Ashah Manghanmal (Nursing Lecturer, College of Nursing, Johor Bahru)

ABSTRACT

Technology in education has advanced significantly and in tandem with these advances and the nations ICT agenda, nursing education in Malaysia must play its role in application of new technological and pedagogical advances towards achieving a knowledgeable and skillful workforce. A local study was conducted on a group of nursing students (n=58) using the traditional approach and the blended approach in teaching Myocardial Infarction. In the blended approach, an instructional design was used together with face to face interaction. Results showed significant differences in achievement (mean 15.21 and std dev. 2.06) in the group taught with the blended approach. In general these students (Group1) demonstrated positive acceptance of its use as they found this approach different, exciting and interesting. Investigation into educator's perceptions of the use of instructional technology and a blended approach in nurse education indicated that educators need proper preparation and support in this endeavor. Findings have implications for improving knowledge and use of information technology, for review of the nursing curriculum and for addressing identified institutional and administrative barriers.

1. INTRODUCTION

Technology in education has advanced significantly from overhead projectors as primary teaching aids in the traditional classrooms to use of electronic mail, search engines, chat rooms, internet and software programs. Nursing Colleges in Malaysia are being challenged by the Ministry of Health's vision to provide healthcare that is equitable, affordable, and technologically appropriate with emphasis on quality, innovation, and health promotion (Ministry of Health Malaysia, 2000) towards an enhanced quality of life. In order to support the resulting complex nurse education programs and increased numbers of nursing students, there has been heightened interest in maximizing the efficiency and effectiveness of teaching and learning. E-learning is seen by many as an answer to some of these issues. Simply defined, E-learning is the facilitation of learning through the use of electronic technology. According to (Young 2000), E-learning enables educators and students to process information that is accurate, unduplicated, error-free and accessible from remote areas by multiple persons at the same time. Present day students are just as bright and capable as those from prior generations, but they are living in a social world which is surrounded by technologies. What they need is something they can interact with in a way with which they are familiar. Interactive media offers learning that appeals to these learners with the sounds, images, and words being available at the same time. The authors felt that in the e-learning environment, what is presently taught in classrooms can made accessible to the students anytime, anywhere and students can learn at their own pace. Practical skills and knowledge can be taught through computer assisted learning material, virtual learning and teleconferencing

2. LITERATURE REVIEW

Many studies have been done to evaluate and compare traditional and e-learning courses. Ryan, Carlton, and Ali (1999) conducted a study to evaluate traditional and web-based courses. more in depth, students felt they had more interaction with the course faculty and other students, and that more communication skills were required than the web-based course. In the web-based course the most significant finding in the Ryan et al. study revealed that students demonstrated a higher level of analysis and were able to critically think through better the application of theory to case studies. The evaluation results of a web-based and traditional-based course by Willis, Stommel and Simmions (2001) showed that on average, students

rated both courses the same in terms of learning, quality of instruction, and their enjoyment. According to Young (2000) computer skills will soon be prerequisite for information-related disciplines and those who possess computer skills will have an edge over those without such skills. Related literature revealed that nurse educators must learn how to use technology. However, the acceptance of new teaching styles are not quickly embraced or adopted in nursing (Rankin & Hoaas 2002 Oermann 1997 Halloran1995). Skills are needed in accessing, managing, and examining information (Young, 2000). Nursing education must be ready as information technology evolves. Leaders in nursing education must work to ensure that faculty and students will be aware, understand, and apply technology appropriately. Learning technologies can be used by nursing students all over the globe to communicate with and support each other. Amongst those that can be used in nurse education are: *Websites and intranets, Computer assisted programs, Interactive Video Instruction (IAV), Virtual lecture halls and Virtual reality simulators or Human patient simulators (HPS) and Games. Other then that online examinations and assessments can be done and e- portfolios have been used.* While there are many technologies and many teaching approaches to use, learning requirements and preferences of each learner tend to be different. Academic organizations must use a blend of learning approaches to get the right content in the right format to the right people at the right time.The term "blended learning" is appearing with increasing frequency in academic literature. It has recently been identified as *"the single-greatest unrecognized trend in higher education today"* (Young, 2002). Blended learning uses both online activities with traditional classroom teaching and thus offers the efficiency and flexibility of online delivery without the complete loss of face- to- face interaction. There are many reasons why an instructor might choose to design a blended learning environment over a non-blended environment. Osguthorpe and Graham (2003) identified six reasons that these individuals might be choose to design or utilize a blended learning environment:

(1) pedagogical richness,
(2) access to knowledge,
(3) social interaction,
(4) personal agency,
(5) cost effectiveness, and
(6) ease of revision.

3. NURSE EDUCATION IN MALAYSIA

The authors, through their many years of experience, felt that despite widespread availability of instructional technology, traditional classroom lectures are still the mainstay of nursing college teaching. Even if the computer is used, more often than not a PowerPoint presentation is used to replace the whiteboard and overhead transparencies in delivery of content. The authors strongly felt that e-learning could make a difference for nursing education in Malaysia and produce better student outcomes. However, in terms of e-readiness, we need more environmental, technical and financial (organization and individual) readiness, in order to enable learner readiness.The authors thus recommended blending learning approaches be used in nurse education as nursing students and nursing colleges in Malaysia are not ready for total e- learning courses yet.

4. THE STUDY

A quasi-experimental design study was used to compare use of the traditional lecture method and the blended approach to teach Myocardial Infarction to nursing students pursuing the Diploma in Nursing course, to investigate if there was a significant difference in their achievement. Students and tutors perceptions were also assessed through interviews. A convenience sample of 58 nursing students in their second year of training in a local nursing college was selected for this study. The ADDIE model was used to design instructional technology material on *Myocardial Infarction* and sequenced according to Gagne's Nine events of Instruction (1979). Pre Test was conducted on the 2 groups whereby the students sat for the same MCQ (multiple choice questions) test. Results are shown in Table 1.

Table 1: Pre test results

	Group 1	Group 2
n	29	29
mean	11.03	11.38
Std dev	2.06	1.72
f=1.42	df(28)	p<0.173

Two days after the pre test, one group that is Group 2 (n=29) received the traditional lecture on that topic and for Group 1 (n=29) the blended approach was used to teach the same topic. The tutor used instructional technology and also the face to face approach. Student - student and teacher-student interactions were carried to discuss the topic. After a week, post tests were conducted for the two groups. The group exposed to the blended approach achieved higher post tests scores (Table 2).

Table 2: Pre test results

	Group 1	Group 2
n	29	29
mean	15.21	14.21
Std dev	2.04	1.63
f=1.57	df(28)	p<0.121

The authors then carried out focus group interviews on the students that were exposed to the blended approach, to assess their perceptions on the use of instructional technology and blended learning in their nursing course. Students' perception of e-learning is an inherently important criterion by which we can evaluate program effectiveness. (Biner, P.M, Dean R.S & Mellinger A.E 1994).On the whole the nursing students were more excited and interested in the instructional technology used and paid full attention in class. "*We were not sleepy ……and we found it to be very interesting….* something different ….we can understand better and have a clearer picture now…for example we now know what an angioplasty looks like". Students however did not find it convenient to chat with the tutor on line as access and time were their problem. Only 15 % managed to look up the web references due to similar problems. Adding to that the references were all in English and the English was "too high" for them. 76% of the students agreed to this. They would have preferred if the articleswere extracted by the tutors and given to them as handouts as it 'saves time'. They would have preferred articles in Bahasa Malaysia also. Although students agreed that this approach was more flexible and interesting, they actually seem to prefer face-to-face education (95%) as it made them more secure. This preference became more evident when learners realized that undertaking e-learning or blended learning courses would be more demanding than traditional methods because learners have to demonstrate their engagement in the educative process by taking part in online discussions with tutors and peers and looking for material themselves. Individual interviews with the tutors were also conducted to assess their perceptions on the use of instructional technology and the implementation of blended learning in nursing education.These interviews revealed varying perceptions and many perceived barriers. The tutors did agree that *e- learning was in trend now and would be a good way to teach nursing students as the knowledge was up to date and there was 'so much more information available*' However they did perceive many barriers to the implementation of e- learning here . Elsewhere several studies have looked at this issue, with similar results (Ross 2005), showing barriers related to attitude, knowledge, access, cost, and security concerns all being impediments to the use of technology for learning. In this study, lack of time to plan and prepare technology infused lessons was identified as a major obstacle. The tutors stated that technology integration was new to them and their workloads and schedules precluded taking time to design lessons that included technology. Tutors did not have much knowledge and skills in preparing instructional materials (75%) …we mainly use the power point for text and look for images …we are not very familiar with on line discussions and Learner Management Systems . .." (more than 70%) The problem with access was also an obstacle to our local tutors. Even though 100% of the tutors had a PC or a laptop, internet access was a problem to some as they had to share the facilities with others and had frequent trouble with access.. Technical support is very critical for success as indicated in Woo and Kimmick's (2000) study. Our nursing tutors are facing similar problems "We waste a lot of time when technical complications occur … there's no expert in the college. We need to get help from outside.…its very frustrating when the LCD or internet fails to function or breaks down" Interestingly, some misconceptions were revealed during the interview whereby some

tutors voiced out their concerns about employers who might prefer nursing students who had completed traditional education over those whose nursing programs that had been undertaken online. What they failed to realize that there is no two way about clinical practice ('hands on') and it will still be the mainstay of nurse education practical training. Others voiced out their belief that some e-learning programs eroded contact and interaction with students and could lead to ' passive learning'. This however is contradictory to the many beliefs in the potentials of e-learning and that fact that e-learning is based on constructivism and results in active learners.

5. IMPLICATIONS

Healthcare learners and teachers will need preparation and support if they are to benefit from e-learning. Successful adoption of e-learning requires a shift in learning and teaching culture. . Learners and educators will need to develop new attitudes and skills to ensure they have positive learning and teaching experiences. E-learning initiatives that need to be looked into include promoting e-learning through more training, creating more public policies and infrastructure and perhaps having a one stop centre for e-learning. The issue of limited time, problems with access and lack of technical support should be addressed in all educational institutions. All non-computer based materials associated with academy instruction (books, software and digital still and video cameras) should be provided.Computers/laptops and internet facilities should be made accessible so that tutors and students would have the equipment and resources needed to apply and implement the instructional ideas and methods. The problem of language needs more attention even though nursing students are attending English Language classes.Limitations of study were the small sample size and the instructional design which was for one topic only and not the whole course. More research is needed to determine the learning effectiveness of blended approach to learning versus the traditional classroom.Because technology will continue to advance, so must educational delivery systems. With blended learning, the true and tried traditional teaching methods are combined with new technology to create a teaching-learning structure that can propel learning to new heights. So why take one item from the menu when you can have the buffet?

REFERENCES

Biner,P.M., Dean,R.S & Mellinger,A.E. (1994) Factors underlying learner satisfaction with interactive telecourses . The American Journal of Distance Education 8, 60-71

Gagne,RM.(1979) Principles of instructional design.New York : Holt , Rinehart and Wilson.

Glesne,C.,& Peshkin, A. (1992). Becoming qualitative researchers: An introduction. New York: Longman

Gonzalez, C. (2004) The role of Blended learning in the world of technology. Retrieved March10, 2006 from http://www.unt.edu.benchmarks/archieves/2004/september04/eis.htm

Halloran,L.(1995). A comparison of two methods of teaching: Computer managed instruction and keypad questions versus traditional classroom lecture. Computers in Nursing, 13(6), 285-288

Manuel,P.,& Sorenson,L. (1995) Changing trends in healthcare: Implications for baccalaureate education practice and employment. Journal of Nursing education, 34, 248-253

Oermann,M.(1997).Computer use in ADN programs. Nurse education, 22(6), 8-12

Osguthorpe, R.T., & Graham,C.R. (2003). Blended learning environments: Definitions and directions. Quarterly Review of Distance Education, 4(3), 227-233.

Rankin,E.C. & Hoaas,D.J.(2001) Teaching note: Does the computer generated slide presentations in the classrooms affect student performance and interest? Eastern Economic Journal, 27(3), 355-366

Schaefer,K.M., & Zygmont,D.(2003). Analyzing the teaching style of nursing faculty: Does it promote a student- centered or teacher-centered learning environment? Nurse Education

Perspectives , 24 , 238-245

Woo,M. & Kimmick, J.(2000) Comparison of the internet versus lecture instructional methods for teaching nursing research. Journal of Professional Nursing,16(3) , 132-139

Young, J. R. (2002). 'Hybrid' teaching seeks to end the divide between traditional and online instruction. Chronicle of Higher Education, pp. A33.

http://www.georgiasouthern.edu/ijsotl Online teaching and learning challenges International Journal for the Scholarship of Teaching and Learning Vol. 1, No. 2 (July 2007)

A USABILITY STUDY ON CONTENT DISPLAY IN MOBILE LEARNING

Riaza Rias (Faculty of Information Technology and Quantitative Sciences, MARA University of Technology, Shah Alam, Selangor, Malaysia; riaza@tmsk.uitm.edu.my); Fazilah Ismail (Faculty of Information Technology and Quantitative Sciences, MARA University of Technology, Shah Alam, Selangor, Malaysia; fazilah@tmsk.uitm.edu.my); Azlan Ismail (Faculty of Information Technology and Quantitative Sciences, MARA University of Technology, Shah Alam, Selangor, Malaysia; azlan_a@tmsk.uitm.edu.my)

ABSTRACT

Mobile technology has started to play many important roles in our lives. In education, mobile technology could assist learning while students are on the move by using mobile devices such as personal digital assistant (PDA), mobile phones or a laptop. We look at PDAs in this study. One of the problems faced by small devices are the way to display information on a small screen size. A navigation technique is implemented to display the content for learning programming in C++ on a PDA. A usability study is also conducted on the prototype design using QUIS guidelines on 10 students. We discuss the results of the usability study.

Keywords: Mobile technology, PDAs, usability, programming in C++

1. INTRODUCTION

Mastering C++ is not an easy task for many students since C++ has been well known as a tough subject that must be taken by computer science students. The toughness of this subject has caused students not to be interested in learning more about C++. That is the reason why C++ records the highest failure rates compared to other subjects taught in Faculty of Information Technology and Quantitative Sciences (FTMSK). Mobile technology is not new in our daily lives, which includes in the learning environment. Instead of reading passive reference textbooks, students can learn in an interactive way using Personal Digital Assistant (PDA) that is believed to further enhance and motivate learning. In order to motivate and assist students to build a tough understanding on the most important concept in programming, a prototype for mobile learning application is developed and focused on designing interface for learning C++ on a PDA. A navigation technique and other user interface aspects of the development are also focused in the study. To evaluate the usability of the prototype devel oped, a Questionnaire for User Interaction Satisfaction (QUIS) was used as a guideline.

1.1 Mobile Learning Concept

Mobile learning is a flexible transformation from traditional learning into different learning situation using mobile device. Mobile device is any computing device like PDA that can be carried anytime, anywhere with the ability to provide information and enable users doing activities while on the move. Unlike traditional classroom learning which is located in fixed place with common resources, a single teacher and agreed curriculum, mobile learning have no specific time and place, but totally depends on the flow of daily activities (Sharples, Corlett & Westmancott, 2002). Mobile learning complements the existing practice inside the classroom with informal learning situation outside the classroom. Mobile learning only functions as a supplementary for education using new mobile technology and does not replace formal education (Sharples, 2005). Mobile technology can be used as a bridge between this formal and informal learning environment. Mobile learning has a good potential as a new learning strategy in which people can manage their own learning to enhance their knowledge and skills (Sharples, 2000).

1.2 Possibilities of a PDA

PDA has been foreseen to become prominent computing devices in the future by combining easy carry-on feature of mobile phones with the processing capacity of personal computers. Although the PDA is not intended to fully

replace conventional computers, it is able to run most applications that are normally supported on the desktop. To be competent with this new learning approach, students need to integrate this technology into their daily instructional activities. According to research conducted at Open University in United Kingdom, people are interested on learning using PDA due to its portability (Waycott & Kukulska-Hulme, 2002). PDA strongly supports distance education by assisting students' self-managed learning activities around other tasks. The capability in assisting learning anytime and anywhere, students are able to use their time effectively. The PDA is very good in recording notes where it is able to effectively summarize course material and keep notes better organized. By keeping handy course material, reading can be done in various situations. The PDA is important in revision process where students can grasp good understanding on what they learn from reading. In addition, most PDA technologies today are equipped with browsing facility and Wireless Application Protocol (WAP) service for Internet surfing, which are beneficial for all users. Therefore, the PDA is very good as a supporting tool for printed material.

1.3 Constraints of a PDA

There are also several limitations in which limited screen size has become a big constraint. In a situation where font sizes are enlarged, the amount of information that can be viewed on the screen is reduced, while smaller font size causes reading difficulties that result in slower reading and less accuracy. Navigation is also difficult especially when users need to move back and forth the entire document. Text-input mechanism on a PDA is equipped with a touch-sensitive screen that enables direct manipulation on the screen interface. Small on-screen keyboard and writing on screen in a special handwriting script which is then converted by handwriting recognition system contribute in slower speed and decrease accuracy, make it not so beneficial for entering text (Waycott & Kukulska-Hulme, 2002).A PDA as a learning aid is not intended to replace desktop computers but it is used in conjunction with other tools like desktop computers to enhance learning capability.

1.4 Navigation Technique

Navigation is a path taken to find certain information on pages and get back whenever needed (Kaikkonen & Roto, 2003). According to Chan & Sharples (2002), navigation involves tapping activity on an outer node that brings to an inner node and consequently open the item associated with it. Navigation that was based on point-and-click interaction style finds intended location by highlighting on words, maps and iconic buttons (Dix, Finlay, Abowd & Beale, 2004). Navigation assisted by arrows was a good guidance for users' way finding and was easily used (Ekman & Lankoski, 2002). Kaptelinin (1995) indicates that the scroll bar navigation causes the slowest performance in navigating sites. Otherwise, Overview-based navigation technique limits the amount of scrolling by providing context information that enables users to make decision on which path to take (Jones, Buchanan & Thimbleby, 2002). Therefore, overview-based navigation was more effective than using scroll bar (Kaptelinin, 1995). Mackay (2003) emphasizes that navigation technique involves data modification technique and data overview technique.

2. THE PROTOTYPE DESIGN

The hierarchy diagram shown in figure 1 follows the rules of a navigation technique. The hierarchy links screens or pages in logical groupings. According to Dix et al. (2004), deep hierarchies are difficult to navigate. Therefore, this prototype structures broad top-level categories in hierarchy while others are in linear sequence. The linear part contains next and previous links between items in the same group. Figure 1 illustrates the hierarchical diagram for the prototype of learning C++.

3. USABILITY STUDY

The prototype is evaluated to measure how well it meets user requirements and subjective satisfaction. The usability testing or evaluation can help to find hidden and overlooked problems in the prototype design. Usability testing requires users to test the prototype and detect where they encounter difficulties with the interface. For prototype of learning C++ on a PDA, the usability testing

is organized to measure users' impressions about using this prototype in terms of the presentation styles. Most importantly, this testing gives an accurate result on how well navigation technique applied in displaying information on a PDA affects user satisfaction.Ten students are selected in this usability testing. All of them are FTMSK students who have taken CSC 125 paper. During this testing, they are given a set of questionnaires. Then, a short briefing is given to ensure all of them get a clear message and the same understanding. This is important in order to get a valid result. After that, all of them test the prototype prior to their feedback in the questionnaires that has been given earlier. The result of the usability testing is presented in Table 1. Table 1 shows that most of the respondents do not face much usability difficulties while navigating the prototype. For backtracking facilities, only one respondent feels unsatisfied because she prefers Breadcrumb navigation.

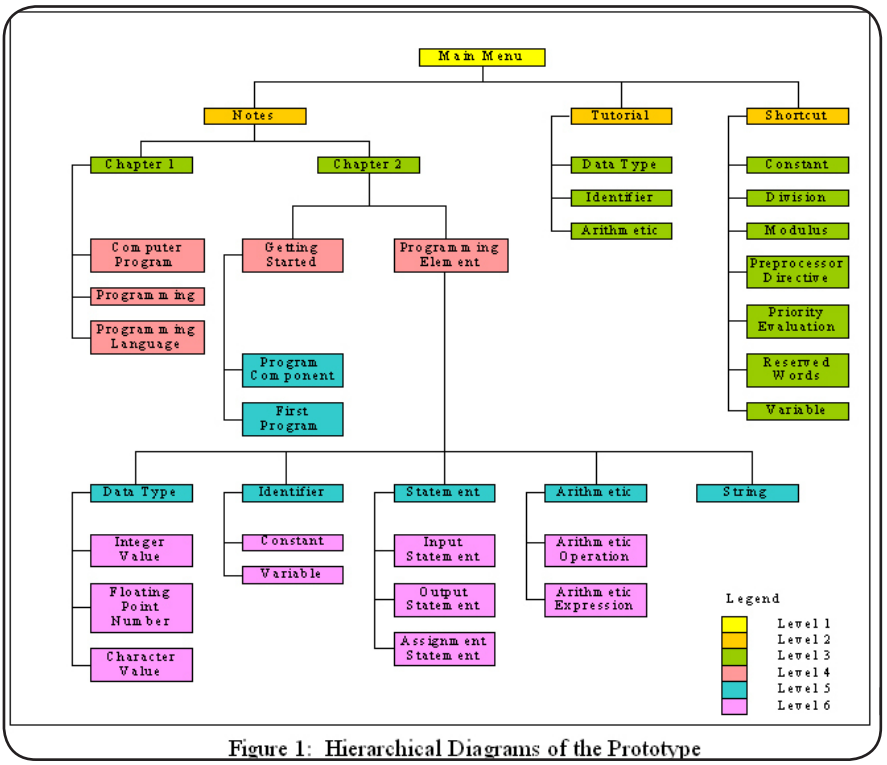


Figure 1: Hierarchical Diagrams of the Prototype

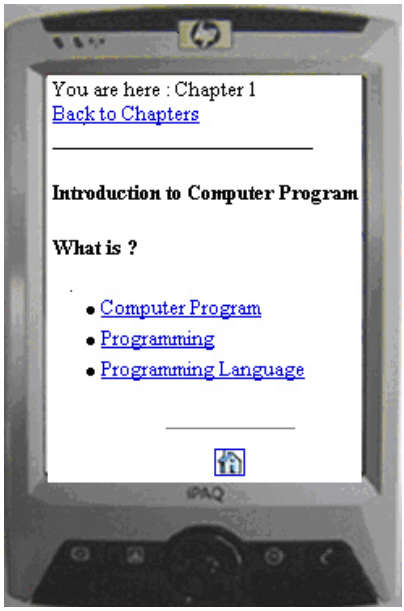


Figure 2: Sample screen shows Introduction to Chapter 1

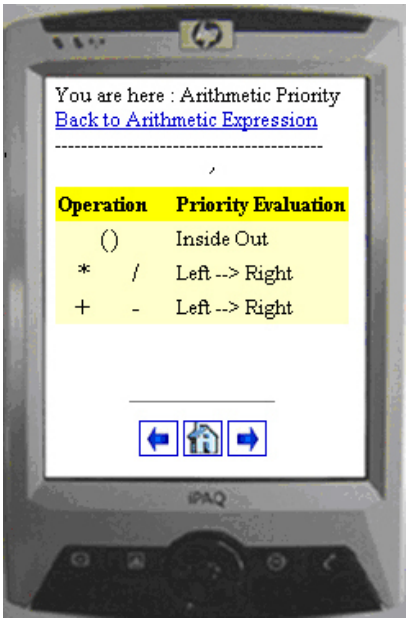


Figure 3: Sample Screen shows topic on Arithmetic Expression

Table 1: Result of Usability Testing Based on QUIS

Items	Number of Respondents						
	Bad	1	2	3	4	5	Good
Overall user reactions							
Overall reactions to the system.	Terrible	0	0	2	7	1	Wonderful
	Frustrating	0	0	2	7	1	Satisfying
	Difficult	0	0	1	6	3	Easy
Screen							
Characters on screen	Hard to read	0	0	1	6	3	Easy to read
Use of colors for highlighting	Unhelpful	0	0	2	4	4	Helpful
Amount of information displayed on screen	Inadequate	0	0	4	5	1	Adequate
Arrangement of information	Illogical	0	0	1	5	4	Logical
Sequence of screens	Confusing	0	0	0	7	3	Clear
Back to previous screen	Impossible	0	0	1	5	3	Easy
Terminology							
Use of work related terminology	Inconsistent	0	0	2	5	3	Consistent
Learning							
Learning to operate the system	Difficult	0	0	0	7	3	Easy
Task can be performed in straight-forward manner	Never	0	0	2	7	1	Always
Number of steps per task	Too many	0	0	1	8	1	Just Right
Icons usage are meaningful	Confusing	0	0	4	3	3	Clear
Comment							
Interesting style of learning	Disagree	0	0	2	3	5	Agree

that shows paths through prototype hierarchy. However, Breadcrumb navigation backtracking cannot be applied to this prototype due to limited screen space. Most users claim that this prototype provides clear sequence of screens, easy backtracking, enables task to be performed in straight forward manner and provides suitable number of steps per task. This finding is believed to be resulted from the navigation technique applied. The presentation styles evaluated in this usability testing are studied previously in literature and produce a positive result. From Table 1, it can be concluded that respondents are satisfied with the legibility of characters on screen, the use of colors for highlighting, the amount and arrangement of information, the use of work related terminology and the easiness to operate the prototype. Nobody feels unsatisfied with the items tested while only a small number stands on moderate level. A casual discussion with some of the respondents indicates that they feel easy to operate by following links in hierarchical structure without getting lost. When navigating through this prototype, they can determine their current location, find way forward and backward, and easy to predict where the focus will move next. The information contained also can be easily understood. Eight out of ten respondents claim that the prototype provides interesting style of learning.

4. CONCLUSION

From literature and this study, it is found that there are three factors that need to be considered when designing interfaces on a PDA;

i)Reduce scrolling to prevent to be lost in hyperspace situation

ii)Avoid text entry due to slower text input mechanism and

iii)Avoid excessive information.

Navigation techniques, which employ hierarchical structure, provide solution for scrolling. Additionally, navigation technique that is based on point-and-click interaction on links provides alternative for text entry interaction on a PDA. Generally, it is concluded that the navigation technique and presentation style applied in this prototype help to boost user satisfaction.

REFERENCES

Chan, T. & Sharples, M., A concept mapping tool for pocket PC computers, Proceedings of IEEE International Workshop on Wireless and Mobile Technologies in Education, Sweden (2002), 163-164.

Dix, A., Finlay, J., Abowd, G. D. & Beale, R. (2004). Designing the user interface: Strategies for effective human-computer interaction (3rd ed.). USA: Addison Wesley.

Ekman, I. & Lankoski, P., What should it do?: Key issues in navigation interface design for small screen devices, CHI '02 extended abstracts on Human Factors in Computing Systems, Minnesota (2002), 622-623.

Jones, M., Buchanan, G. & Thimbleby, H., Sorting out searching on small screen device, Proceedings of the 4th International Symposium on Mobile HCI, Pisa (2002), 81-94.

Kaikkonen, A. & Roto, V., Navigating in a mobile XHTML application, Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, Florida (2003), 329-336.

Kaptelinin, V., A comparison of four navigation techniques in a 2D browsing task, Conference companion on Human Factors in Computing Systems, Colorado (1995), 282-283.

Mackay, B., The gateway: A navigation technique for migrating to small screens, CHI '03 extended abstracts on Human Factors in Computing Systems, Florida (2003), 684-685.

Sharples, M. (2000). The design of personal mobile technologies for lifelong learning. Computers and Education, 34, 177-193.

Sharples, M., Corlett, D. & Westmancott, O. (2002). The design and implementation of a mobile learning resource. Personal and Ubiquitous Computing, 6, 220-234.

Sharples, M. Learning as conversation: Transforming education in the mobile age. Paper presented at Conference on Seeing, Understanding, Learning in the Mobile Age, Budapest (2005).

Waycott, J. & Kukulska-Hulme, A. (2002). Students' experiences with PDAs for reading course materials. Personal and Ubiquitous Computing, 7, 30-43.

A PRELIMINARY STUDY OF E-LEARNING CRITICAL SUCCESS FACTORS: THE STUDENT PERSPECTIVES

Othman Zainon (College of Science and Technology, University Technology Malaysia *City Campus*. Kuala Lumpur othman08@citycampus.utm.my); Maslin Masrom (College of Science and Technology, University Technology Malaysia City Campus. Kuala Lumpur. maslin@citycampus.utm.my); Rosdina Rahiman (College of Science and Technology, University Technology Malaysia *City Campus*. Kuala Lumpur. rosdina@citycampus.utm.my)

ABSTRACT

In this recent day, information technology becomes prominent to support teaching and learning activities. E-learning also known as online learning was one of information technology (IT) tools introduced at College of Science and Technology (CST), University Technology Malaysia (UTM) City Campus Kuala Lumpur since 2001. It represents an innovative shift in the field of learning, providing rapid access to specific knowledge and information, and offers online instruction that can be delivered anytime and anywhere through a wide range of electronic learning solutions such as Web-based courseware and online discussion groups. It can be viewed as making learning materials such as presentation slides available on the web. The aim of e-learning, as any other learning approach is to achieve the learning objectives. Until today students in CST used the e-learning technology only for accessing the syllabus and course content, submitting assignments and taking class quizzes. Meanwhile, most of CST instructors had been given several e-learning courses and workshops by Centre of Teaching and Learning (CTL) in University Technology Malaysia regarding course content development. In this connection, the instructor plays a central role in the effectiveness and success of e-learning based courses. This paper will focus on issues relating to the e-learning critical success factors (CSFs) from student perspectives. In this study two main issues related to the e-learning CSFs within a university environment addresses include instructor characteristics and student characteristics.

Keywords: e-learning, critical success factors, College of Science and Technology

1. INTRODUCTION

The rapid growth in the use of the internet has led to a new dimension in interactive and collaborative learning anytime and anyplace dynamically. Electronic learning or e-learning introduced since 1990s had improved teaching and learning styles, and qualities. There are many definitions given to e-learning, but here we define e-learning as any learning that is done using an internet or intranet connection. This e-learning represents an innovative shift in the field of learning, providing rapid access to specific knowledge and information, and offers online instruction that can be delivered anytime and anywhere through a wide range of electronic learning solutions such as a web-based courseware and online discussion groups. It can be viewed as making learning materials such as presentation slides available on the web. Nowadays e-learning has become an accepted educational paradigm across universities worldwide (OECD 2005) E-learning also known as online learning was one of ICT tools introduced at College of Science and Technology (CST), UTM since 2001.

- Constructing
- Collaborating
- Creating
- Sharing

With regard to this learning environment and activities in the system, the universities can provide students with not only good understanding and create new ideas, but also can share the idea and work in team.In order to achieve the above objectives, the universities have been making heavy investment in the implementation of e-learning programs. Despite the many uncertainties occurred throughout the process, part of the teaching

and learning processes are moving towards the internet usage. These uncertainties bring about difficulties for academic administrators, who face the challenge of keeping the focus on essential and relevant aspects that will assure programs success. Accordingly, full understanding of the factors contributing to effectiveness of e-learning system is needed to help universities funding to effective factors and eliminate non-effective factors. Therefore, the objective of this study is to determine the critical success factors acceptance of e-learning by students.

2. CRITICAL SUCCESS FACTORS

Critical success factors (CSFs) are viewed as those activities and constituents that must be addressed in order to ensure its successful accomplishment. The term CSFs can be viewed as those things that must be done if an organization is to be successful, and CSFs should be few in number, measurable and controllable. E-learning CSFs included intellectual property, suitability of the course for e-learning environment, building the e-learning course, e-learning course content, e-learning course maintenance, e-learning platform, measuring the success of an e-learning course, evaluating the learning and the students' performance, technology, instructor, and previous use of technology. According to Selim (2005), e-learning CSFs within a university environment can be grouped into four categories such as instructor, student, information technology and university support. Instructor plays a central role in the effectiveness and success of e-learning based courses. The effectiveness of e-learning can be determines by the instructional implementation of the information technology (IT). Instructors should adopt interactive teaching style, encourage student-student interaction, and have good control over IT. University students need to have time management, discipline, and computer skill in order to be a successful in the e-learning era. Student prior IT experience such as having a computer at home and attitude towards e-learning is critical to e-learning success. E-learning integration into university courses is one of components of the IT explosion. The efficient and effective use of IT in delivering e-learning based components of a course is of critical important to the success and student acceptance of e-learning. There fore, the university IT infrastructure should be rich, reliable and capable of providing the courses with the necessary tools to make the delivery process are smooth as possible. The IT tools included network bandwidth, network security, network accessibility, audio and video plug-ins, video conferencing, user interface etc.

3. METHOD

Courses selected for the study were e-learning and all of them are computer desktop-based courses. E-learning tools used are electronic student-student and student-instructor communication. Data were collected through anonymous survey instrument administered to 1500 diploma students during the 2006/2007 session. The survey instructed students to provide honest feedback about their experiences with the e-learning approach. The survey targeted first year, second year and third year students at the College of Science and Technology and 822 responses were achieved, giving a 54.8% response rate. A survey instrument consisted of 3 sections, one for each e-learning CSF category (including the instructor characteristics and student characteristics sections) and the demographic characteristics section. The instructor characteristics section comprised 13 items that evaluate the characteristics of the instructor (that is, to represent instructor's attitude towards the technology, teaching style, and control of the e-learning technology). These 13 items were adopted from Volley and Lord (2000), and Soong et al. (2001). Meanwhile, the student characteristics were assessed by 22 items adopted from Soong et al. (2001) and Selim (2005), and items 8 through to 22 were excluded from further study and will be used in a follow-up article. Therefore, only seven items were considered in the study. The first two items measured the student motivation to use e-learning, and another five items measured the student computing competency. All items used a five-point Lickert scale of responses: 1-Strongly Agree, 2-Agree, 3-Neutral, 4-Disagree, and 5-Strongly Disagree.

4. RESULT AND ANALYSIS

The profile of respondents is depicted in Table 1. Respondents were majority male (58.8%)**4** compared to female (41.2%). By age, respondents were grouped into 17 to 19

(51.9%), 20 to 22 (46.9%), 23 to 25 (1.1%) and 26 to 28 (0.1%). Meanwhile for student level from first year student level is repre sented by 33.3%, second year student level is represented by 54.3%, and third year student level is represented by 12.4%. The reliability analysis was conducted in order to ensure the internal validity and consistency of the items or indicators used for each variable. Table 2 shows the Cronbach alpha values for the two e-learning CSFs. The suggested accepted values for Cronbach alpha from 0.6 to 0.7 were deemed the lower limit of acceptability. An alpha of more than 0.7 would indicate that the items are homogeneous and measuring the same constant (Hair et al., 1998) and all factors in Table 2 exhibit a high degree of internal consistency as the alpha values are more than 0.70.The results of the instructor descriptive analysis are as the following:

- Instructors should be able to handle the e-learning technology such as e-mail and e-forum effectively.
- Instructors should have positive attitude towards interactive learning and teaching via e-learning technology.

Table1: Respondents Profile

Item		Frequency (n)	Percentage (%)
Gender	Male	483	58.8
	Female	339	41.2
Age (years)	17 to 19	427	51.9
	20 to 22	386	46.9
	23 to 25	8	1.1
	26 to 28	1	0.1
Year (Student level)	First year	274	33.3
	Second year	446	54.3
	Third year	102	12.4

Table2: Reliability Analysis

Critical Success Factor (CSF)	Cronbach Alpha
INST (Instructor characteristics)	0.912
STUD (Student characteristics)	0.936

Based on descriptive analysis, mean and standard deviation were calculated as stated in Table 3 and Table 4. Table 3 and table 4 present the measures of students' perspectives of the e-learning acceptance. Respondents have a positive opinion towards e-learning usage when the mean values for the measures show more than average and above. Further, the standard deviation (SD) for all success factor to the success of e-learning. measures showed less than 1, indicated that there was less variation among respondents' opinion to each measure.

- Instructors should be able to encourage and motivate students to use e-learning. In other words, instructors should depend on e-learning tools such as online quiz or exam, and attract the students to depend on the tools provided in the course.

Table 3: Descriptive Analysis – Instructor Characteristics

Survey Question	Mean	SD
The instructor handles the e-learning units effectively. ***(control of the e-learning technology)***	2.55	0.92
The instructor explains how to use the e-learning components. ***(control of the e-learning technology)***	2.64	0.95
I feel the instructor is keen that we use the e-learning based units. ***(attitude towards the e-learning technology)***	2.59	0.87
The instructor encourages and motivates me to use e-learning. ***(teaching style)***	2.56	0.90
The instructor is active in teaching me the course subjects via e-learning. ***(teaching style)***	2.65	0.93

Survey Question	Mean	SD
The e-learning encourages me to participate more actively in the discussion than the traditional methods. ***(student motivation to use the e-learning technology)***	2.50	0.86
I am not intimidated by using the e-learning based courses. ***(student computing competency)***	2.61	0.81

In this study, the student as a factor contributing to the success of e-learning at the tertiary education was categorized into two factors capturing the students' perspectives of student motivation to use the e-learning technology and the student competency. The results of student descriptive analysis can be summarized as below:

- Most of the student responses were posi tive indicating a satisfaction with e-learn ing tool such as e-forum or e-discussion.
- Most of the students had exposed to com puting skills and e-learning experiences.

The descriptive analysis results and the students' perspective about the CSFs indicated the most critical factor to the success of e-learning courses was the instructor characteristics. Meanwhile, the student characteristics factor was perceived as the moderate critical

5. CONCLUSIONS

E-learning has been adopted by many universities. This paper specified two e-learning critical success factor categories that can help universities to efficiently and effectively adopt e-learning technologies. The specified e-learning CSF categories were based on students perceptions and included instructor characteristics (attitude towards interactive learning and teaching via e-learning technology and teaching style), and student characteristics (motivation to use e-learning and student computer competency).This study indicated that the instructor characteristics factor is the most critical factor in e-learning followed by the student characteristics factor, that is, the instructor is the key to successful

e-learning courses in the higher education institutions. Therefore, instructors should have adequate computing skill, and training must be provided in the technical aspects of the e-learning technology and in how to use these tools pedagogically. Likewise students' computing literacy also needs to be enhanced.

6. ACKNOWLEDGEMENTS

The support of all the students involved in this research is gratefully acknowledged.

REFERENCES

Hair, J., Anderson, R., Tatham, R. and Black, W. (1998. Multivariate data analysis. Prentice Hall, 5th edition

OECD (2005). E-learning in tertiary education: where do we stand?. Education & Skills, 4, 1-293.

Papp, R. (2000). Critical success factors for distance learning. Paper presented at the Americas Conference on Information Systems, Long Beach, CA, USA.

Santoso, H.B. and Hasibuan, Z.A. (2005). The use of e-learning towards new learning paradigm: case study student centered e-learning environment at Faculty of Computer Science – University of Indonesia. Proceedings of the Fifth IEEE International Conference on Advanced Learning Technologies (ICALT '05).

Selim, H. M. (2005). E-learning critical success factors: an exploratory investigation of student perceptions. In M. Khosrow-Pour (ed.) Managing Modern Organizations with Information Technology. Proceedings of the 2005 IRMA International Conference, San Diego, 340-346.

Soong B.M.H., Chan, H.C., Chua, B.C. and Loh, K.F. (2001). Critical success factors for on-line course resources. Computers & Education 36, 101-120.

Voley, T. and Lord, D. (2000). Critical success factors in online education. The International Journal of Educational Management 14, 216-223.