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Issues of Choosing the Suitable Virtual Learning Environment

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Abstract: This study discusses issues of choosing suitable Virtual Learning Environment, the design and development of the online course: "Introduction to Computer Science", accompanied with the results of the pilot testing of the course. This course is delivered to first year students in the faculty. As in the era of mass higher education and lifelong learning, online education is becoming more and more popular. E-learning offers the student more flexibility and freedom in time and space of learning. Embedding E-learning in existing educational systems poses important issues for institutions. Offering the students an online course that is designed and developed properly to suit various levels of students, and cater to various personal capabilities is a very difficult matter taken into consideration that the tutor and the students can only meet virtually. Quality of course design, use of appropriate tools and the context in which learning takes place are prime factors affecting success of online education.

Key words: Designing online course, learning management systems, online learning

INTRODUCTION

Traditional ways of teaching depend on tutors. Teaching students in classrooms using blackboards was used for centuries in teaching around the world. Shifting from these well known traditional ways of teaching to the modern approach of E-learning is a challenge but yet interesting and promising step. E-learning is an approach to facilitate and enhance learning based on both computer and communications technology. Advances in hardware technologies, open source software and ease of communications made it possible to a wide range of people to own a computer system at reasonable price and get high speed Internet access.

The availability of both computer and communications technology enabled us to explore the shift to e-learning in universities across the region as a way to provide higher education for a wide range of people at an affordable cost. For example, according to the Arab Advisors Group (Stiles, 2000), Internet users are expected to grow from 1.94 million by end of 2003 to reach 5.6 million by end of 2008, a penetration rate of 7.4%. In some parts of the region there are barriers to accessing traditional forms of higher education, particularly in areas with a large rural hinterland, e.g. Turkey, or where mobility is restricted. E-learning offers a mechanism to overcome these barriers of access and mobility by providing convenient and safe access to education. Student demand also cannot be ignored. Across the region students are becoming more technically savvy, and they want to get many of their course materials off the Web. Once online, they expect to be able to communicate with tutors or their peers whenever their schedules permit.

Web-based processes of learning produce an enlarged structural opportunity at many levels. Careful structuring of the virtual space supports and adds quality to collaborative learning between students and to instruction. Such enhancement in quality may take place through use of individual and collaborative spaces for learning activities, overview of process and content, increased clarity of learning expectations, and facilitation of collaborative and individual processes of reflection and self-reflection (Sorensen *et al*., 2002).

We think that embedding of E-learning in the university will have a great impact on the way of teaching and we wish that its use would be seen by teachers and learners as part of the normal portfolio available to facilitate learning. This paper describes an experiment in building a Virtual World for educational use on the Internet. The main part of the paper details the course design and the choice of Moodle as the virtual learning environment. This paper is organized as follows: first we present a background for the work conducted, then we

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discuss the reasons of choosing a virtual learning environment to work with, and outlines a comparison between different virtual learning environments. A given description of our course curriculum, structure and design is then followed. The pedagogical guidelines are presented while designing the course material. Experiments are conducted and finally, remarks are concluded

RESULTS AND DISCUSSION

Background: The course "Introduction to Computer Science" was developed as part of the Mediterranean Virtual University (MVU) project. The MVU is a joint project between the EU and Countries of the Mediterranean. The European Union (EU) funds the project and it brings 11 universities in the Mediterranean region together with two European Union universities who are leading the way in E-learning. The syllabuses of the courses were derived from the ACM course guidelines. The developers attended a series of workshops in Denmark, Jordon, Turkey and Egypt to introduce and train them on the chosen Learning Management System (LMS): Moodle, and on principles of online course design.

The Virtual Learning Environment (VLE): Virtual learning environments are software packages designed to help educators create and deliver online courses. Such e-learning systems are sometimes called a Learning Management System (LMS), Course Management System (CMS), Virtual Learning Environments (VLE), or education via Computer-Mediated Communication (CMC). VLEs allow lecturers to create resources quickly and without the need to develop technical skills. Typically Web-based, VLEs provide an integrated set of internet tools, enable easy upload of materials and offer a consistent look that can be customized by the user.

A comparative table:

Virtual learning environment comparison: The use of E-learning in the majority of universities has begun with the introduction of a Virtual Learning Environment (VLE) (O'Leary and Ramsden, 2002; Pollock *et al*., 2000; Silberman, 1996). Although this project is funded by the European Union, they chose to work on a free VLE, which is Moodle. We decided to make a comparison between the available free VLEs to assure that Moodle is really the suitable choice and it holds the suitable features for a good learning environment (Table 1). (http://www.moodle.org; http://www.claroline.net; http://www.atutor.ca).

Moodle: The chosen VLE: As seen from the previous section, the features mentioned showed that each VLE has its benefits/disadvantages over the other VLEs. In Moodle and A Tutor there would be no need for HTML knowledge when authoring content. A Tutor is the only system to allow course users to intercommunicate. However, one of the most important features appeared here is the compatibility of Moodle with Shareable Content Object Reference Model (SCORM) and its ability to use XML metadata to describe e-learning content within the system.

We agreed with the managing committee of the MVU project on the choice of Moodle as the LMS to develop and deliver the online courses. Moodle has existed since 1999 with continuous improvement in following versions. The last version of Moodle 1.9.5 was released on 13th May, 2009. The decision for the choice of Moodle as the LMS for the MVU was taken based on various reasons. First of all, Moodle is free, open source software, supported by a team of programmers and the users' community all over the world. It is free software to be downloaded, use, or even modify. The open source nature of Moodle has contributed towards its quick bug fixes. Second, Moodle runs without modification on many different platforms; Windows, UNIX, Linux, Mac OS X, and any other systems that support PHP. Data is stored in a single database: MySQL and PostgreSQL are best supported, but it can also be used with other commercial databases. Moodle has many fine features to facilitate online delivery of courses, including: Forums, content managing (Resources), Quizzes with different kinds of questions and several activity modules. Moodle also supports SCORMS which facilitates movement of modules to other LMS platforms without modification, i.e. supporting portability of developed modules. Finally, we found Moodle's interface is the most instinctive, and featured a very simple to use editor with small problems in dealing with mathematical symbols that can be overcomed (http://www.moodle.org; http://en.wikipedia.org/wiki/Moodle).

Although theoretically Moodle was chosen to be used as our virtual learning environment, we decided that the pilot testing will be the real proof of the success of our choice where criteria as navigability, organization, written material, accessibility, and aesthetic design will be considered by the students themselves.

Course planning and design: Most of the work in transforming the multidisciplinary course; Introduction to Computer Science to online course was done in this phase.

Curriculum and course planning: As the syllabus is one way to tell the students which way they ought to go, so the first step taken was planning the course syllabus. The syllabus was derived from the latest published ACM model Curriculum and Guidelines for undergraduate

Table 1: A comparative table between the VLEs: Claroline, Moodle and Atutor

Type of Comparison	Claroline	Moodle	Atutor
Creation	Consortium of French University faculties	PhD student called Martin dougiamas	Toronto University in Canada
Installation	Some complications due to the original programming language (French)	Simple and aided by several automated pages, which speeded up the installation	Easiest and aided by installation screens via an internet browser
Written language	PHP and MySQL		
License agreement	Open source (GPL)		
Customization	Through style sheets		
Cost	Freely downloaded, installed and distributed without charge		
Common features	- Theme feature allows the change of look and feel of the VLE without a new style sheet. - Agenda feature which allows authors to set weekly announcements in advance.		
Common features between Claroline and Moodle	- Courses are broken down into component elements and then published to the site under separate areas (announcements, exercise, chat etc) - Courses can start with a limited number of resources, but grow in size and complexity. - Students have full flexibility in the order that they undertake the elements of the course. - Categorized links feature to manage relevant URLs. - Offers fully optional layout for course beneficiaries. - Ability of the course administrators to set exercise and assign completion deadlines. - Students can upload their own papers for peer review.		
Common features between Moodle and Atutor		- Inbuilt glossary function. - 'Send course email' feature to allow all course students to be contacted simultaneously - Flexible assignment creator tool - Excellent documentation and help manuals. - Dynamic site mapping feature that grows as more courses are authored on the system.	
Different features between the three VLEs	- Chat facility for all users (text interface system) - Can upload video files for use as course recourses - Statistics function for course administrators to monitor number of courses, courses popularity, etc - Supports multi languages.	- Basic security features to limit customer access to particular courses. - Journal feature to allow students to post questions, maintain a course diary, or aid revision. - SORM standards compliant - Use XML metadata to describe e-learning content within the system.	- Course construction broken down into a series of 'content pages' - Structure is built on a 'slide by slide basis' but would require HTML skills. - Integrates editor for creating content without the need for HTML knowledge. - Print compiler tool-allows student to select pages of text and group them together on one page - Context sensitive help. - Links to various other educational databases are included with the download package.

degrees in IT, which is the ACM (2001). This published curriculum is the result of the joint activity of the Computer Society of the Institute for Electrical and Electronic Engineers (IEEE-CS) and the Association for Computing Machinery (ACM) to develop curricular guidelines for undergraduate programs in computing. Both the ACM and IEEE are highly respected scientific communities and many notable universities in the world follow their curriculum guidelines.

ACM curriculum specifies the objective for each course, the topics covered and the specific learning objective of each topic to be achieved by the student once this topic is completed. Accordingly, we have divided the course at hand into 5 modules; the single module may contain more than one topic but we have taken good care about the existence of the internal consistency among the different parts. Each module consists of several activities;

Tasks for students to undertake that provide an experience likely to lead them to the desired new understanding. Each activity designed to accomplish one or more of the learning objectives (Fig. 1).

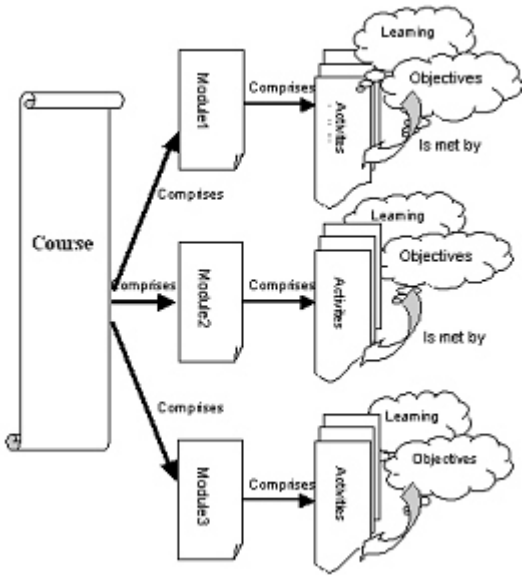

Fig. 1: Course planning and organization

Course design: Design of the course is detailed in what is called the Course Pro-forma. The pro-forma starts by identifying the basic information for the course at hand, followed by the modules' names "main subjects within the course" and finally, follows several tables, one for each activity. In the pro-forma, contents and the way the materials are organized and presented should be broken down into small units. It may correspond to a single instructional objective or learning activity, but sometimes

more than one learning objective can be met by the same activity. This help the student to gain the learning experience needed.

Activities in the course are the major building blocks; each activity is a complex structure, starting with supplying a material in different formats (PDF, HTML, POWER POINT, or an online lecture), followed by extra elaboration in the form of examples and/or animations. Finally, some questions to ensure grasp of information and assessments. As we have mentioned that the course is a multidisciplinary one, so we have tried to join all the modules together through a connected thread of activities where the important ideas are woven together. Here the student has to use the information and knowledge gained in a previous module or lesson to help him in learning the new concept or even in solving some problem. That what we called modules' dependency which leads us to the importance of the suitable design and the correct sequence of the lessons that the student has to follow to gain the greatest benefit from the course and help in achieving the desired goals.

The activity table specifies details of the activity. The table contains information on the activity title, which will perform the activity either by the student, group of them or by the instructor. It also mentions the type of activity, brief description about what this activity is designed to do and its aim, status either mandatory or not and the sequence f the module. The table also shows how the modules will be assessed, if the student will submit the answers or there is a quiz. It also determine when it will be assessed; in the beginning of the module or in the final exam. Finally it shows the learning objectives that this activity will achieve. Of course this helps to know at the end that there are activities that serve all the learning objectives specified by the course. These points were taken into consideration while designing the course:

- Lessons are organized in sequential form but few questions are added between lessons to refresh the student's memory before transferring to the next lesson.
- Important ideas are repeated periodically to provide reinforcement.
- Opportunities for interaction through student activities and exercises are embedded throughout the course.
- Adding examples with buttons for answers and this gives the student a suitable slice of time to think but leaves him with a feeling of relief that he will not be lost if he didn't know the answer as just pressing the answer button shows him the solution instantly.
- Adding animated flashes for demonstrating the subjects or examples where appropriate.
- Quizzes templates are made to help the student to self assess and give him his marks instantly and this helps him to evaluate himself before the formal assessment.
- Students receive regular feedback on their assignments and progress in the course

Course development: The course was developed by writing html lessons using html editor with the use of interesting formats, content, or methods to capture student attention. Also we tried to deliver Information in a number of different formats and different media to appeal to varying interests and backgrounds. Each is transformed to a SCORM and uploaded to Moodle. Simulation through examples and illustrations that substitute the step by step explanation done by tutors in face to face environments were developed using Swish application and embedded into the SCORMS before being uploaded to Moodle. The course was designed and developed in 10 months; it is now in the testing stage.

Pedagogical guidelines: Although the tools deployed may have varied, all the development teams tried to follow sound pedagogical guidelines while designing the course material. These guidelines where Bloom's taxonomy, Gagne's Nine Events of Instruction and the Guerra scale. These concepts and their relation to the course are presented below.

Bloom's taxonomy: The Bloom's taxonomy (Forehand, 2005), (Bloom and David, 1956) classifies the forms and levels of learning. The taxonomy divides the objectives of learning to six levels as shown in Fig. 2. It starts from the lowest level of learning "Knowledge" up to the highest form of learning "Evaluation". Bloom suggested that one couldn't effectively address higher levels until those below them have been covered.

Gagne's nine events of instruction: Gagne's book, The Conditions of Learning, first published in 1965, identified the mental conditions for learning. These were based on the information-processing model of the mental events that occur when adults are presented with various stimuli. Gagne created a nine-step process called the events of instruction, which correlate to and address the conditions of learning.

Guerra scale: The Guerra scale (Guerra and Heffernan, 2004), shown in Fig. 3, outlines the range of online content that can be used. It describes an increasingly interactive user experience using a one-to-ten scale, in which "one" involves the common experience of simply reading text on a screen and "ten" represents a virtual reality scenario. In addition to a more interactive user experience, each step up on the scale represents an increase in complexity, functionality, development time,demands for programming skill, demands for instructional design versatility, and demands for more patience and attention from subject matter experts.

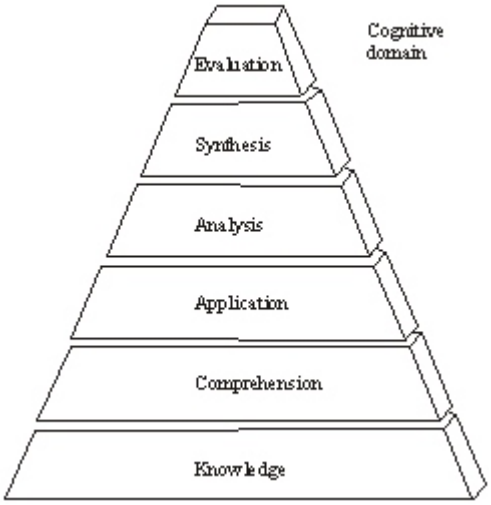

Fig. 2: Bloom's taxonomy

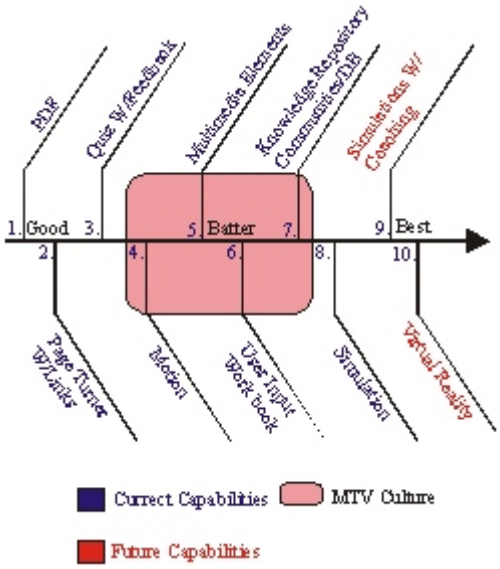

Fig. 3: Guerra scale, levels of online user experience

Conducted experiments: The course has been tested by first year students where they attended classes in fixed dates. The developers attended as supervisors to collect students' comments and watch their reactions towards the course and the environment. We allowed 27 students in the first grade in the faculty of Computers and Information sciences, to take this course. We made a questionnaire to know their opinions about the course design and material. The questionnaire was divided in four sections: Course navigability and organization, written materials, Universal accessibility and Aesthetic design.

Figure 4, summarises the results obtained, an average of 15.92 students decided that the course navigability and

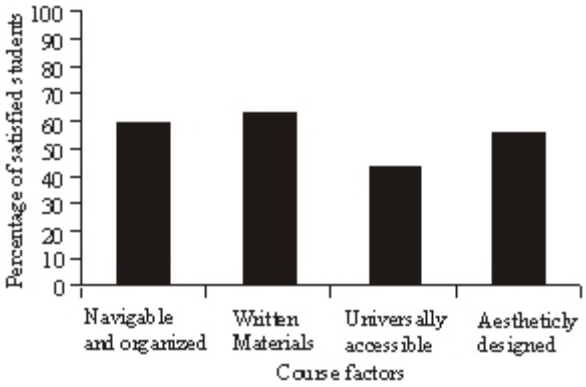

Fig. 4: Course evaluation outcomes

organization is good with a percent of 58.97%. An average of 17 students decided that the written materials are well defined with a percentage of 62.96%. An average of 11.6 students decided that the course is universally accessible with a percentage of 42.96%. An average of 15 students decided that the course is has an artistic design with a percentage of 55.56%.

Most of the students' comments reveal the importance of interactive or animated demonstrations embedded within the course; they were very popular and get the student involved to a great extent. The lessons written in short paragraphs and bulleted points, summary at the end inform the student about the aim of the subject without being lost (as it was the way in long paragraph lessons).

The students liked the self-assessment quizzes very much and admitted that they were very helpful in evaluating their level and refreshing their memories before they go through the real grade assessment. Enhancement of the course material and structure are going on after receiving the students' comments.

CONCLUSION

The Internet offers potential benefits such as flexible access and new ways of communicating and assessing for students and lecturers. Making use of the Internet for online education poses important educational issues for educational institutions. The work in this study has addressed some issues for effective online education. Offering online courses can overcome the weak points of the past and provided the learner with an interactive positive experience leading to better learning environment. The issues addressed in this study include: proper choice of the virtual learning environment and self experience in designing an online course. It also states the stages passed through during the development process and our points of view in each stage trying to achieve the best structure, clear objectives, planned participation, synthesis and simulation. Also, the pilot testing assures the

usefulness of the choice of Moodle as our virtual learning environment while it will not prevent us from working by other VLEs.

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