Some Issues and Challenges in E-learning Methodologies and E-assessment System

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Abstract - *E-Learning, or Computer Assisted Learning is now one prime research area of computer science as well as in Education Science. E-learning can be defined as learning through the new Information and Communication Technologies or ICT. In Education we have various types of teaching learning methodologies such as conventional educational system or face to face interaction, postal coaching based on printed study materials, distance education system where teaching learning process has two major components one is study material and the second is counseling sessions and now after year 2001 we have added one more education system called e-learning methodologies. E-learning is assisted by e-assessment or Computer Assisted Assessment (CAA). The CAA has an important role to issue certificates to the successful candidates in e-learning. The e-learning will not be a successful method if it is not supplemented by proper computer assisted evaluation process. In the present paper we have made a thorough study on different aspects of e-learning methodologies, Learning Objects(LO) and Computer Assisted Assessment. The CAA platform is called as eWorkbook. The system can be used for evaluating a learner's knowledge by conducting learner on-line tests. The time is coming when e-learning will be the best possible method of transmitting education among people located far away from any academic institution. Moreover due to flexible time policy in e-learning the busy people can also take the advantage of it. The authors have tried to explore different features of e-learning methodologies and also the e-testing mechanism.*

Keywords: e-learning, Computer assisted learning, ICT, Computer assisted assessment

1 Introduction

e-learning may be defined as "learning through the new Information and Communication Technologies or ICT. The word e-learning is a combination of two fields one is Distance Education and the other is Computer Based Training(CBT). In CBT Computer is used as the main tool for learning process. The CBT software and the materials are now available in different media such as CD, Internet website etc. Normally the software is made in such a way that anyone can learn the subject using self-learning instructional material.

Distance Education or Distance Learning is not a new teaching learning methodology. The distance education slowly developed due to the requirement of the learners those who reside in remote places and cannot come to take education from a reputed institute which may be far away from him/her. The distance education can be thought of three generations. The first generation is the nineteenth-century native teaching through postal communication. The second generation starts in the 70s and makes use of TV, Radio and satellites. The third generation based on data networks. The word E-learning came when the CBT was combined with the collaborative use of data networks. This event coincides with the time in which hypermedia resources started to be distributed through the Internet, that is, with the introduction of the World Wide Web. E-Learning is an interdisciplinary area of scientific research. To make E-Learning successful the researchers from education science and computer science have to apply their mind together. The education scientists have to give more interests in pedagogical aspects of e-learning and the computer scientists have to give more interest on the technology part of the e-learning process. To design e-learning system one has to design the intelligent tutoring systems, to standardize e-learning system, to design e-testing methodology, use of Web Technology including usability and accessibility etc. The use of e-learning in education has implied a transition from an institution–centered model to a learner-centered model. In e-learning sometimes one has to mix traditional instructional materials with newer technology based material. This approach, called blended learning method and it is more suitable in those environments in which the pedagogical aspect prevails over the mere competency transfer one. Blended learning forecasts that the normal lessons are integrated with on-line lessons and with the availability of instructors and learners of synchronous (chat, videoconference) and asynchronous (e-mail, forum) communication tools. In any academic institution the blended learning approach is commonly used e-learning methodology.

A piece of e-learning material, of any granularity, is commonly referred to as Learning Object (LO). According to IEEE Learning Technology Standard Committee (IEEE LTSC, 2007), the Learning Object (LO) is any entity, digital or non-digital, that may be used for teaching and learning process. According to ADL SCORM (ADL, 2007) LOs in the minimal form of teaching learning objects are called assets. An aggregation of LOs, which can be distributed in a content package, is a Content Aggregation. Another important characteristic of LOs, according to SCORM's classification, is their capacity of being launched in the learning environment and of establishing a communication with it. A LO equipped with a module which gives such functionalities to it is called a Sharable Content Object (SCO). The software system for the production of LOs is the LO authoring tool, while the software system for administering LOs to learners and for creating a collaborative learning environment is commonly called Learning Management System (LMS).

One important aspect of e-learning is the standardization of e-learning systems. Standardization in e-learning methodology is mainly aimed at achieving interoperability among Learning Management Systems (LMSs) and Learning Object (LO) authoring tools. The term Computer Managed Instruction (CMI) or SCORM Run-Time Environment often refers to a set of functionalities which allow LOs to be launched in the LMS and to exchange data with it. Their adoption is crucial in the achievement of full interoperability among LMSs and LO authoring tools. Even desirable, standard compliancy and guideline adoption are difficult to obtain for LMS producers. In the present work the authors have presented a thorough study on adoption of CMI functionalities in Object-Oriented and Message-Oriented LMS systems, respectively. The former is framework, named CMIFramework, which allows LMS developers to rapidly adopt CMI functionalities in Object-Oriented systems. The latter is a Service Oriented Architecture (SOA)-based reference model for offering the CMI functionalities as a service, external to the LMS.

2 What is E-Learning?

E-learning is not just about training and instruction but also about learning that is made for individuals. There are different terminologies which have been used to define on-line teaching and learning process. There is no straight forward definition of e-learning is available till now. To define e-learning the commonly used terms are Internet learning, distributed learning, networked learning, tele-learning , virtual learning, computer-assisted learning, Web-based learning, and distance learning. E-learning also includes the delivery of learning material through Internet, satellite broadcast, audio-video tape/CD, interactive TV program and CD-ROM. All of these terms mean that the learner is at a distance from the tutor or instructor, and the learner uses some form of technology (usually a computer) to access the learning material, and that the learner uses technology to interact with the tutor or instructor and other learners, and that some form of support is provided to learners. E-learning refers to the use of information and communication technology (ICT) to enhance and/or support learning in tertiary education. However this encompasses an ample array of systems, from students using e-mail and accessing course materials online while following a course on campus to programs delivered entirely online. E-learning can be different types, a campus-based institution may be offering courses, but using E-learning is tied to the Internet or other online network. So we can say that E-learning is an education process or system via the Internet, network, or standalone computer. E-learning processes include Web-based training, computer-based training, virtual classrooms and digital collaboration. E-learning means the teaching material is delivered via the Internet, intranet, audio or video tape, satellite TV, and CD-ROM. So one can define e-learning is basically Internet-Based training or Web-Based training. Today you will still find these terms being used, along with variations of E-learning (EL). EL is not only about training and instruction but also about learning that is tailored to individual. Different terminologies have been used to define learning that takes place online.

3 Different Components of E-Learning System:

E-learning system can be broadly categorized into the following:

3.1 E-Learning Courses:

The most important component of e-learning is to prepare educational courses. Educational course materials or courseware are usually modified and added with various different media and are uploaded to a networked environment for online accessing. There are several popular learning management systems such as WebCT and Blackboard which are commonly used by educational institutions to introduce e-learning education system. In achieving a more motivating courseware, courseware designers have began to add innovative presentation such as simulations, storytelling and various other innovative materials. E-learning is very similar to classroom teaching environment whereby both of the learners and the instructors are together related to the common course arrangement and flow.

3.2 Blended Learning

Blended learning or Integrated Learning provides a good transition from classroom learning to e-learning. Blended learning is a combination of a face to face teaching and online learning. This method is most effective for any higher education where both face to face and on-line training is required. It encourages educational and information review beyond the classroom settings. It combines several different

delivery methods, such as collaboration software, web-based courses and computer communication practices with face to face instruction. Integrated learning utilizes the best of classrooms with the best of online learning.

3.3 Informal Learning

Information learning can be said to be one of the most dynamic and adaptable features of learning but it is least recognized. To get any new information we use some search Engine like Google. Each search Engine is coupled with information storage tools, personal management tools. That is why we get any information so fast from Google search engine. Sometimes we get more information during break time than in formal learning environment. We progress more in our jobs through informal learning, sometimes using trial and error and other times through conversations.

3.4 Collaborative Teaching and Study

It is very old style but very effective. This method enables learners to learn something in a small group, then to find similar type of group and then interact with them about one's doubts. This way one can learn a new subject very fast. Collaborative teaching is a teaching method by a group composed of teachers.

To implement this method teacher should focus on the plans he/she put together, teaching, appraisal and making detailed discussions and arrangements of the course outline and content. Collaborative teaching as an innovative teaching method makes use of two or more teachers and assistants contributing their talents in one or several classes and curricula. Collaborative teaching changed the traditional teaching style. With each teacher's academic specialty being employed more diversified learning directions and boundless thought space can be provided for students. Collaborative teaching research was conducted on the core "introduction to design" courses hoping that the teachers could contribute their talents, gain more professional knowledge and form a long-term collaborative group amongst themselves. This is the first motivation. Moreover, the learning motivation is an important factor for effective learning. The teachers should adopt various teaching methods and stimulate students' learning motivation.

3.5 Knowledge Management

Globalization is focused on e-learning because e-learning technology has the potential to bring improved learning opportunities to a larger audience than has ever previously been possible. Knowledge management is an essential process which is concerned with how to create atmosphere for people to share knowledge on distribution, adoption and information exchange activities in an organization. The impression of knowledge management and the theory of e-learning reveal powerful relationship which is causing disarray between the two fields.

3.6 Networks of Learning

Learning network is a procedure of developing and preserving relationship with people and information and communicating to support each other's learning. Therefore Learning network is enhanced and offers chances to its members to engage online with each other, sharing knowledge and expertise. Now the use of pen and paper in our educational system today is producing inadequacy and challenges in the digital era that we are in today where subject matter is changing speedily. The application of personal learning networks will create connections and develop knowledge for workers to remain current in their field.

4 E-Learning Methodologies

E-learning exploits Web technology as its basic technical infrastructure to deliver knowledge. The current trend in any academic or industry is to increase the use of e- learning and in the near future a higher demand of technology support is expected.

4.1 Interaction in Learning

Learner(s) and Tutors(s) Interaction, then Learner(s) and Learner(s) Interaction are two types of interactions are among humans. We are familiar with these types of interactions. Most of the research studies are based on these two types of interaction, especially in the research of Computer Assisted Collaborative Learning (CACL). If collaborative type of study is used in an online class then students should be more motivated to actively participate in online social interactions. This increased active group interaction and participation in the online course, hence, resulted in higher perceptions of self-reported learning. Whereas individuals working alone online tended to be less motivated, perceive lower levels of learning, and score lower on the test of mastery.

In CACL, researchers usually distinguish two types of interactions. One is called synchronous interaction, requires that all participants of interaction are online at the same time. Examples of synchronous interaction include Internet voice telephone, video teleconferencing, text-based chat systems, instant messaging systems, text-based virtual learning environments, graphical virtual reality environments, and net based virtual auditorium or lecture room systems. Synchronous interaction promotes faster problem solving, scheduling and decision making, and provides increased opportunities for developing. However, the cost of synchronous interaction is usually very high, and synchronous interaction is more constricted due to time differences. The second method is asynchronous interaction, in which learners or tutors have freedom of time and location to participate in the interaction, examples including interaction using e-mail, discussion forums, and bulletin board systems. It has been reported that by extending interactions to times outside of classes, more persistent interaction and closer interpersonal bonds among students can occur. Thus, while one cannot totally simulate a real

classroom with synchronous interaction, one can offer asynchronous interaction that provides time for better reflection, and allows global communication un-bounded by time zone constraints. Asynchronous interaction thus is more commonly provided in CACL systems than the costly synchronous interaction.

4.2 Self-paced e-Learning

Learners are offered e-learning courseware (also called Web based training (WBT)), which can be complemented by supplemental resources and assessments. Courseware is usually housed on a Web server, and learners can access it from an online learning platform or on CDROM. Learners are free to learn at their own pace and to define personal learning paths based on their individual needs and interests. E-learning providers do not have to schedule, manage or track learners through a process. E-learning content is developed according to a set of learning objectives and is delivered using different media elements, such as text, graphics, audio and video. It must provide as much learning support as possible (through explanations, examples, interactivity, feedback, glossaries, etc.), in order to make learners self sufficient. However, some kind of support, such as e-mail based technical support or e-tutoring, is normally offered to learners. When self paced e-learning is offered through an Internet connection, there is the potential to track learners' actions in a central database.

5 E-Assessment System

E-Assessment, also known as Computer Assisted Assessment (CAA), is a sector of e-learning aimed at assessing learner's knowledge through e-learning means. The reduced human contact between the instructor and the learner, due to distance, besides the necessity of evaluating a big mass of learners in strict times, affects assessment. Therefore, the means for knowledge evaluation had to evolve to satisfy the new necessities. To conduct structured tests, more rapidly assessable method started gaining a heavier weight in the determination of learners' results. Multiple Choice question type is extremely popular in structured tests, since, among other advantages, a large number of its outcomes can be easily corrected automatically. Each question contains multiple options. The only correct answer is called the "key". Several commercial and open source e-assessment systems are available for administering tests based on it. Furthermore, being still actual the necessities of measuring learner's participation to the class, some metrics and tools have been developed to measure it. A state of the art analysis allowed us to identify the following important requirements for an effective environment for developing and using assessment tests:

(1) High reusability of the authored content.
(2) The courses and classes must be well organized.
(3) There must be flexible access control system to the tests.
(4) The authored content should have quality tracking.
(5) The reporting section should be well planned.

The e-assessment system can be used for evaluating a learner's knowledge by creating (the tutor) and taking (the learner) on-line tests based on multiple choice question types. The questions are kept in a hierarchical repository, that is, it is tree-structured, in the same way as the file system of an operating system. In such a structure, the files can be thought of as questions, whether the directories can be thought of as macroareas, which are containers of questions usually focused on the same subject. A macro area can still contain other macroareas. The tutors are free to organize the tree as they wish, e.g. keeping the questions of the same course in a macroarea and further splitting it according to the chapters they cover. Every item (a macro area or a question) has an owner, which is the tutor that authored it. The tutors can choose whether to share their questions or not, assigning a value to the permissions associated to each item. Permissions are for reading, writing and using the items. Some other information about the questions is present in the repository, such as: difficulty (selected by the tutor), language, keywords, number of times the question was selected for a test and expected time for a learner to answer. The tests are composed of one or more sections. This structure facilitates the selection of the questions from the repository, but it is still useful for the assessment, where it can be important to establish if one section is more important than another to determine the final grade for the test. There are two kinds of sections: static and dynamic. The difference between them is in the way they allow question selection. For both the static and the dynamic sections, a macroarea in the question repository must be specified. For a static section, the questions are chosen directly from the sub-tree located by the specified macroarea. For a dynamic section, some selection parameters must be further specified, leaving the system to choose the questions randomly across the sub-tree located by the specified macroarea whenever a learner takes a test.

6 E-learning Tools

There are three types of e-learning tools:
(i) Curriculum tools,
(ii) Digital library tools and
(iii) Knowledge representation tools.

We can generally say that each type of tool emphasizes different aspects of the e-learning process. Curriculum tools provide a systematic and standard environment to support classroom learning; their functions are particularly helpful in the initiation and selection stages. Digital library tools facilitate effective and efficient access to resources to support exploration and collection. Knowledge

representation tools focus on formulation and representation. Now we will discuss these three tools in detail.

6.1 Curriculum Tools

Curriculum tools are widely used in high school and college of education. Materials are selected and organized to facilitate class activities. Additional tools, such as discussion forums and online quizzes, are integrated to support collaboration and evaluation. A typical commercial curriculum tool includes three integrated parts: instructional tools, administration tools, and student tools. Instructional tools include curriculum design and online quizzes with automated grading. Administration tools include file management authentication, and authorization. Student tool functions include:

(a) Browsing class material: readings, assignments, projects, other resources

(b) Collaboration and sharing: asynchronous and synchronous bulletin boards and discussion forums.

(c) Learning progress scheduling and tracking: assignment reminders and submission, personal calendars, and activity logs.

(d) Self-testing and evaluation: tests designed by instructors to evaluate student performance

WebCT and Blackboard are the most popular commercial curriculum tools. A review comparing these two tools suggests that Blackboard's flexible content management and group work support [3] make it more suitable for independent and collaborative learning. WebCT's tighter structure and fully embedded support tools make it more appropriate for guided, less independent learning. In general, these tools are tailored more to support class activities than independent research or self-study.

6.2 Digital Library Tool

The curriculum tools support class functions, while digital library tools focus on locating resources. These functions support the exploration and collection phases of information search. Digital library tools help users find the right information. Digital library features usually include search, browsing, and discovering special collections or exhibits. Search and browsing are used to locate resources and explore related topics. Special collections or exhibits contain organized materials representing a unique treasure for interested users.

6.3 Knowledge Representation Tool

Knowledge representation tool help learners to visually review, capture, or develop knowledge. Curriculum tools rely primarily on a text-based, syllabus approach to describing course content. This approach often fails to describe the relationship of concepts and skills covered in one course to those covered in another. It also fails to show the knowledge base that a learner will have acquired at the end of his/her course of study. A visualization tool can engage both learners and instructors in an active learning process when they construct spatial semantic displays of the knowledge, concepts, and skills that the learner possesses and acquires. The e-Learning evolution proposes a good number of tools assisting the instructional designer during the analysis, design, implementation, and delivery of instruction via the Web. If on one side an automated support should be provided by authoring tools on the other side these tools should implement suitable e-learning process design methodologies.

7 Conclusion and Future Scope

In modern education system E-learning is one of the best methods for exchanging knowledge between teacher and the taught. The rapid growth in internet technology has made E-learning so useful for everyone in the globe. Unlike conventional educational system it allows us to gather knowledge and education both by synchronous and asynchronous mode. E-learning delivers content through electronic information and communications technologies (ICTs). The use of these facilities, involves various methods which includes systematized feedback system, computer-based operation network, video conferencing and audio conferencing, internet worldwide websites and computer assisted instruction. This delivery method increases the possibilities for how, where and when employees can engage in lifelong learning. E-learning has opened the door for learning lifetime. The major success of e-learning depends on its e-evaluation system. In the present work we have given some idea how the evaluation process may be done in e-learning process. But there is a lot of scope to improve it. Finally we conclude that synchronous tools should be integrated into asynchronous environments to allow for education "anywhere" and "any-time". This environment would be primarily asynchronous with background discussion, assignments and assessment taking place and managed through synchronous tools that integrate into the asynchronous environment. There is lot of scope to work on e-assessment system and in Mobile Learning or m-Learning. The authors are presently working on that.

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