



E-learning: An Overview

Vijayalaxmi Sirohi¹

ABSTRACT

Learning is an active process of constructing knowledge. It is individual in nature. Various tools are employed to make the process of teaching and learning effective. In keeping with advancement of technology, the tools have undergone modifications in sophistication. From simple chalk and black board, they have come a long way to computers with multimedia and teletechniques.

1. Introduction

E-learning is the name given to computer enhanced learning. Computers play a big role not only in learning but education as such. The role of computers in supporting the cause of education varies greatly. Information technology is used both as medium and tool in education. An ATEE (Association for Teacher Education in Europe) report (Rhys Gwyn, 1986) lists six categories under this –

- Tools for thinking (problem-solving tools)
- Tools to organize information (text processing and document preparation)
- Tools for guided discovery learning (simulation systems, educational games, intelligent tutor systems)
- Tools for teaching and learning
- Tutorial software
- Drill and practice

History

PLATO (Programmed Logic for Automatic Teaching Operations), developed in 1960 at the University of Illinois at Urbana-Champaign is the first general purpose e-learning system. The first CAI (Computer Aided Instructions) system of Math for K-6 was then written by Science Research Council. Wicat systems developed authoring tool using Pascal to develop learning contents. The first complete CAI classroom for K-6 students was set up at Waterford elementary school in Utah using the Wicat systems. The first public CAI classroom was implemented in Singapore by Ball systems with Wicat system. From this design, the entire computer learning centers globally evolved. These are the forerunners of e-learning.

2. Aids to e-learning

With the advancement of science and technology, the traditional imparting of education is supplemented by the use of audio visual aids like overhead/slide projectors and videos. These are passive teaching tools. Advancement in computer multimedia introduced a new teaching media. Multimedia education has brought in many advantages. User centered asynchronous distance learning with interactivity has brought new vistas of learning. Growth of Internet has introduced a new dimension to learning. Learning material hosted

¹ Kulpati Niwas, Barkatullah University, Bhopal, India (Email: sirohiv@yahoo.com)

and maintained at one place can be accessed globally. Intelligence, interactivity, simulation is worth mentioning here. Dynamic simulation modeling puts the user in the problem area. Many technologies can, and are, used in e-Learning:

- screencasts
- ePortfolios
- Palm pilots
- MP3 Players
- the use of web-based teaching materials
- hypermedia in general
- multimedia CD-ROMs
- web sites
- discussion boards
- collaborative software
- e-mail
- blogs
- wiki (Wiki is a piece of server software that allows users to freely create and edit)
- text chat
- computer aided assessment
- educational animation
- simulations
- games
- learning management software
- electronic voting systems

Most e-Learning situations use combination of the above techniques.

3. Advantages and disadvantages of e-learning

The main advantage of electronic learning is its flexibility and convenience. One can learn at one's own pace by choosing time as per self convenience. As the sessions are asynchronous, it is not bound by time or place. This makes it open ended, most suitable for distance learning. It is very cost effective. Great adaptability to the needs of the learner, more variety in learning experience, repeatability of the learning environment is some of the other advantages. The abstract concepts can be presented better with the help of multimedia.

The greatest disadvantage is the absence of human touch. Education is not just acquiring knowledge; especially educating the young involves personality development. This aspect would be missing in e-learning. Even though human interactions can readily be achieved through audio or video-based web-conferencing programs, threaded discussion boards etc, it will not bring in face to face interaction effect.

4. e-learning environment

Scope of e-learning extends widely encompassing several areas like academic, corporate, service etc. Today e-learning industry comprises millions of rupees. Whatever be the area, creating an effective e-learning environment plays a very important role. It involves institutional (administrative, academic and student service), Pedagogical (goals/objectives, content, design approach, organization, methods and strategies), technological (infrastructure planning, hardware and software), interface design (page and site design, content design, and usability testing), evaluation (assessment of learners instruction evaluation and usability testing), management (maintenance of learning environment and distribution of information) and ethical (social and cultural issues, geographical diversity, learner diversity, information accessibility, etiquette and legal).

Characteristics of a good meaningful e-learning system are

- easy accessibility
- well-designed
- learner-centered
- affordable
- flexible

A well planned, designed, developed and implemented system will be a successful system providing for a

fostered and supported learning. The environment to be created is dependent on the objective of the system. Present talk is confined pedagogical approach. In this approach instruction design is very challenging. Content creation has been a very hot topic of research. Here emphasis would be on content creation for university education. Educational software, the software developed for educational purposes can either Internet based or individual computer based. Khan (3) defines web-based instruction as ‘*a hypermedia-based instructional program which utilizes the attributes and resources of the World Wide Web to create a meaningful learning environment where learning is fostered and supported*’. In web-based instruction the learning material is hosted on the Internet and maintained at one place. This can be accessed globally by thousands of users. Several powerful educational technologies have proved very effective in making learning effective. Intelligent, interactive and simulation are some of these techniques used in this direction. There are several types of educational software. Tutorials, courseware, games, textbooks etc are some of the types available. Content development for any of the educational software is a challenging task.

Presentation and delivery of content is a much attention drawing area commanding lot of research. In pre-computer era the only means of content delivery was text books and class notes. Even with computers many e-learning materials are nothing but a transformation of hardcopy of the learning material to softcopy. New concepts based on new technology, pedagogy, psychology are being adopted to make learning experience a successful one. Multimedia has added a new dimension to this field.

One of the significant presentations of content is the tutoring system. These systems provide instruction to the learner in an individualized fashion. It creates a learner centered environment from which the user can derive a system suited to personal needs. Interactivity added to such a tutorial system makes it more efficient. Such interactive tutoring system with intelligence adds a new dimension to efficiency and significance. They guide the users intelligently like human tutors. They support problem solving through intelligent problem solving solutions. Multimedia and simulation, when added, take the system forward. Learning with such system becomes a rewarding experience.

With the adoption of new concepts and technologies the paradigm of web education is shifting from material delivery to learner aid functionality. Here three learning systems are described, which while incorporating the various techniques described above introduce an innovative methodology of presentation and delivery. Each is in a way improvement over the previous. These are

- LIPTOF, **L**ight **P**ropagation **T**hrough **O**ptical **F**iber,
- BAROMA, **B**alance of **R**otating **M**achinery,
- WINDS, **W**eb-Based **I**ntelligent Interactive Course on **D**ata **S**tructures,.

All the three systems are intelligent, interactive and present simulated working models with visual interactive simulation providing for hands-on experience for the learner. They provide a visualization of abstract concepts thus promoting easy understanding of the concepts.

LIPTOF is available at the URLs

- <http://www-cg-hci.informatik.uni-oldenburg.de/~da/sirohi/liptof.html> and
- <http://www.geocities.com/sirohiv/>

The tutorial describes how a light ray is guided through an optical fiber. Along with the basic principle of refraction guidance of light through an optical fiber is described with simulated working models. The learner can vary the input and study the behaviour of light inside the fiber. Intelligent analysis of the problem is also presented. This work was done at university of Oldenburg, Germany. This is extended further in BAROMA with the inclusion of animation. Practically all machinery involves rotating parts. These rotating parts, under non-perfect situations transmit force and cause unwanted noise and vibration.

This affects the performance and fatigue life of the rotating system. Due to economic reasons, non-perfect parts are manufactured and correction is applied to eliminate unwanted forces. This is termed balance of rotating machinery. The concept underlying this procedure and the technique of balance is described in BAROMA. Animation is included here to visualize rotation and balancing. This abstract concept of balancing is effectively described through animation which otherwise is difficult to demonstrate. Animation can be used interactively to arrive at the balancing solutions for the given output. This work was done at National University of Singapore.

The system can be accessed at <http://www.geocities.com/sirohi/>

While the above two system deal with a single topic WINDS is a courseware. IIT Delhi syllabus is followed for the development of the courseware. This is a web-based intelligent interactive course. It is structured on the lines of integrated intelligent interactive textbook with visual simulation, modeling and animation. Audio clips are incorporated to enhance efficiency. Several approaches are integrated in this system. Intelligent interactive textbook model is fitted into WWW framework. The system supports adaptability. The I³-textbook integrated with tutoring system supporting problem solving. Visual interactive dynamic simulation with interactivity provides for varying the input data and study the behavior under varying conditions. System incorporates many features. Online drawing facility is also included in the system. Any part of the course can be accessed from any other part on demand. Abstract concepts are described by animation. The system is in the form of a hierarchically structured electronic textbook which is comparable to a common text book. There are several visual simulations and animations to visualize the concepts. The system can be used as a supplement to classroom teaching or as a stand alone course material.

The courseware can be accessed at <http://paniit.iitd.ac.in/webiit> and <http://www.cdacmumbai.in/vidyakash/online-content/webiit/default.htm>

5. Concluding Remarks

Considering the advantages and disadvantages of the two learning paradigms, e-learning and traditional learning, now a days the combination of the two are more and more advocated. This type of learning is termed blended learning. In this type of learning effective combination of different modes of delivery, models of teaching and different styles of learning are followed. Communication amongst all the parties involved would be transparent. Essentially blended learning would be an effective blend of face to face teaching/learning and e-learning.

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About the Author

Vijayalaxmi Sirohi has wide experience in the area of computer science and software development. She has M.Sc., Ph.D. and M.Ed. degrees to her credit. Her work experience encompasses IITMadras, IBM India Research lab, National University of Singapore, Singapore, University of Oldenburg, Germany, Technical University Braunschweig, Germany and Case Western University, USA. With the advent of internet she started her research work in e-learning with the usage of internet for elearning and has developed several online courses. She has several published and conference papers, monographs and technical papers to her credit the latest being in the International Journal of e-learning in 2007. Apart from research her work includes developmental work including sponsored projects.