Use of e-Learning tools in engineering education system in India : A review of recent advancements

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Abstract

This paper reviews the different recent E-learning approaches and tools used in engineering education system in India. Engineering education has been traditionally imparted through the lecture-tutorial-laboratory paradigm. Education technology in the last few years has tried to make teaching more effective by supplementing the chalkboard teaching by audio visual aids like overhead/ slide projectors and videos Although e-learning has potential in India, adoption has been slow and will need a major awareness building effort, as the demand for education would go up substantially in the next five years. This necessitates alternative modes of delivering Technical education. A hybrid education system in which equal emphasis is paid to the conventional `face-to-face' format and the facets of e-learning using the tools of technology will be the future trend in India.

1. Introduction

We live in the era of Information Technology. We have to learn where we are? And equip us suitable to the changing scenarios. There is no end for the learning particularly to the academicians. Learning that is supported by information and communication technologies (ICT) is the new technology. Every academician must be aware of this. E-Learning is defined as all forms of electronic supported learning and teaching, which are procedural in character and aim to effect the construction of knowledge with reference to individual experience, practice and knowledge of the learner. Information and communication systems, whether networked or not, serve as specific media to implement the learning process(Mahanta D and Ahmed M., 2012).

Engineering education has been traditionally imparted through the lecture-tutorial-laboratory paradigm. Education technology in the last few years has tried to make teaching more effective by supplementing the chalkboard teaching by audio visual aids like overhead/ slide projectors and videos. The phenomenal growth of Internet has brought in a new teaching media e-learning. The declining cost of Personal Computers, easy and cheaper access to Internet, and improved quality of multimedia software has made it attractive option for both teachers and students. Multimedia courses over the Internet will have the potential to serve a dual purpose by enhancing the learning experience for resident students, while opening the educational experience up to distance students (Gupta A., 2002).

2. Approaches to e-Learning Services

It can be seen then that e-learning can describe a wide range of applications, and it is often by no means clear even in peer reviewed research publications which form of e-learning. However, when instructors say they are using e-learning, this most often refers to the use of technology as classroom aids, although over time, there has been a gradual increase in fully online learning.

2.1 Computer-based Learning

Computer-based learning, sometimes abbreviated to CBL, refers to the use of computers as a key component of the educational environment. While this can refer to the use of computers

in a classroom, the term more broadly refers to a structured environment in which computers are used for teaching purposes. The concept is generally seen as being distinct from the use of computers in ways where learning is at least a peripheral element of the experience (e.g. computer games and web browsing).

2.2 Computer-Based Training

Computer-Based Trainings (CBTs) are self-paced learning activities accessible via a computer or handheld device. CBTs typically present content in a linear fashion, much like reading an online book or manual. For this reason they are often used to teach static processes, such as using software or completing mathematical equations. The term Computer- Based Training is often used interchangeably with Web-based training (WBT) with the primary difference being the delivery method. Where CBTs are typically delivered via CDROM, WBTs are delivered via the Internet using a web browser. Assessing learning in a CBT usually comes in the form of multiple-choice questions, or other assessments that can be easily scored by a computer such as drag-and-drop, radial button, simulation or other interactive means. Assessments are easily scored and recorded via online software, providing immediate end-user feedback and completion status. Users are often able to print completion records in the form of certificates.

CBTs provide learning stimulus beyond traditional learning methodology from textbook, manual, or classroom-based instruction. For example, CBTs offer user-friendly solutions for satisfying continuing education requirements. Instead of limiting students to attending courses or reading printing manuals, students are able to acquire knowledge and skills through methods that are much more conducive to individual learning preferences. For example, CBTs offer visual learning benefits through animation or video, not typically offered by any other means. CBTs can be a good alternative to printed learning materials since rich media, including videos or animations, can easily be embedded to enhance the learning. Another advantage to CBTs are that they can be easily distributed to a wide audience at a relatively low cost once the initial development is completed. However, CBTs pose some learning challenges as well. Typically the creation of effective CBTs requires enormous resources. The software for developing CBTs (such as Flash or Adobe Director) is often more complex than a subject matter expert or teacher is able to use. In addition, the lack of human interaction can limit both the type of content that can be presented as well as the type of assessment that can be performed. Many learning organizations are beginning to use smaller CBT/WBT activities as part of a broader online learning program which may include online discussion or other interactive elements.

2.3 Computer-supported collaborative learning (CSCL)

Computer-supported collaborative learning (CSCL) is one of the most promising innovations to improve teaching and learning with the help of modern information and communication technology. Most recent developments in CSCL have been called E-Learning 2.0, but the concept of collaborative or group learning whereby instructional methods are designed to encourage or require students to work together on learning tasks has existed much longer. It is widely agreed to distinguish collaborative learning from the traditional 'direct transfer' model in which the instructor is assumed to be the distributor of knowledge and skills, which is often given the neologism E-Learning 1.0, even though this direct transfer method most accurately reflects Computer-Based Learning systems (CBL). In Data cloud: Toward a New Theory of Online Work, Johndan Johnson-Eilola describes a specific computer-supported collaboration space: The Smart Board. According to Johnson-Eilola, a "Smart Board system provides a 72-inch, rear projection, touchscreen, intelligent whiteboard surface for work". In Datacloud, Johnson-

Eilola asserts that "are attempting to understand how users move within information spaces, how users can exist within information spaces rather than merely gaze at them, and how information spaces must be shared with others rather than being private, lived within rather than simply visited" . He explains how the Smart Board system offers an information space that allows his students to engage in active collaboration. He makes three distinct claims regarding the functionality of the technology:

1) The Smart Board allows users to work with large amounts of information,

2) It offers an information space that invites active collaboration,

3) The work produced is often "dynamic and contingent"

Johnson-Eilola further explains that with the Smart Board "…information work becomes a bodied experience". Users have the opportunity to engage with—inhabit—the technology by direct manipulation. Moreover, this space allows for more than one user; essentially, it invites multiple users.

2.4 Technology-Enhanced Learning (TEL)

Technology enhanced learning (TEL) has the goal to provide socio-technical innovations (also improving efficiency and cost effectiveness) for e-learning practices, regarding individuals and organizations, independent of time, place and pace. The field of TEL therefore applies to the support of any learning activity through technology (Nagarajan P.and Wiselin Jiji G., 2010).

3. E-learning tools

The developed e-learning tools are organized as a set of laboratory templates; tutorials, education-oriented examples and supplementary materials. A laboratory template is a Web page, which enables the students to select properly all the required components of a project and additional materials that might be useful. Tutorials are divided into the following groups:

• Design scenarios;

• Specification, synthesis

• Standard interfaces with typical peripheral devices;

• Design methods targeted to reconfigurable systems Education-oriented examples demonstrate how to construct reconfigurable circuits based on.

• Reusable hardware description language fragments (RHDLF);

• Templates;

• Demonstration resources organized as education targeted libraries

RHDLFs are pieces of easily customized hardware description language (HDL) code that can be inserted into more complicated HDL-based projects. For example, RHDLFs might be specifications of typical operations, such as interface with a keyboard or binary to BCD converters. Templates are complete customizable specifications for such circuits as finite state machines (FSMs), hierarchical FSMs, parallel FSMs, etc. Demonstration resources are composed of software programs (that enable the students to understand easier and better the proposed task), similar projects and scenarios (illustrating the required sequence of steps and the expectable output or results). The primary objective of education-oriented examples is to explain how to develop real-world projects composed of design cores worked out by the students and supplied components simplifying the project and shortening the development lead-time. The examples are organized in such a way that enables teachers to provide sufficient knowledge within the limited time. Basically, the students' projects are divided in core and supplementary components. The boundary between these components is fuzzy. Dependently on educational targets we can provide either more or less supplementary components and this makes it easier

to adapt the proposed technique to different university curricula (Sklyarov V.and Skliarova I., 2005).

4. Advantages and Disadvantages of e-Learning

Key advantages of e-learning include:
- Improved open access to education, including access to full degree programs
- Better integration for non-full-time students, particularly in continuing education
- Improved interactions between students and instructors.
- Provision of tools to enable students to independently solve problems.
- Acquisition of technological skills through practice with tools and computers.
- No age-based restrictions on difficulty level, i.e. students can go at their own pace.

Key disadvantages of e-learning that have been found to make learning less effective than traditional class room settings, include:
- Ease of cheating.
- Bias towards tech-savvy students over non-technical students,
- Teachers' lack of knowledge and experience to manage virtual teacher-student interaction.
- Lack of social interaction between teacher and students.
- Lack of direct and immediate feedback from teachers.
- Danger of procrastination.

5. Conclusion and Recommendations

E-learning is among the most important explosion propelled by the internet transformation. This allows users to fruitfully gather knowledge and education both by synchronous and asynchronous methodology to effectively face the need to rapidly acquire up to date know-how within productive environments. E-learning material should be based on learning theories. Online learning materials should be designed in small segments, so that they can be redesigned for different learners and different contexts. Learning material must account different learning styles (visual, verbal, kinesthetic). Thus it must be prepared using multimedia tools and include visual information (slides, video, animation) and audio information. The learners should have possibility to choose what mode of information they would like to use. Although e-learning has potential in India, adoption has been slow and will need a major awareness building effort, as the demand for education would go up substantially in the next five years. This necessitates alternative modes of delivering Technical education. A hybrid education system in which equal emphasis is paid to the conventional `face-to-face' format and the facets of e-learning using the tools of technology will be the future trend in India.

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