

Challenges and Prospectus for Research in E-Learning

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Abstract-E-learning systems offer several advantages to both academics and learners such as accessibility, mobility, collaboration, and opening of the educational process for continuous and lifelong learning. However, in order to make e-learning effective, a number of challenges including the ones about transferring the dynamic nature of learning to the new e-learning environment, maintaining student individuality and differentiation according to personal preferences and abilities, as well as motivating and inspiring student that need to be examined and met. In this paper, first of all, we briefly discuss why for e-learning is needed. Then some relevant definitions & explanations follow. Next, follow the elements of e-Learning environments and technology Infrastructure. Next, the fundamentals for Technological Design and the fundamentals for Pedagogical Design are briefly discussed. Finally, we discuss the challenges and the available opportunities for research as a consequence of these challenges.

1. INTRODUCTION

The concepts like E-learning & M-Learning are relatively new terms and have been Evolving over a number of years. In order to set the subject matter in proper perspective we begin with some brief description for each of the concepts.

E-Learning: refers to the use of Internet technologies to deliver a broad array of solutions that enhance knowledge and performance. It is based on three fundamental criteria:

(i) E-learning is networked, which makes it capable of instant updating, storage/retrieval, distribution and sharing of instruction or information.

(ii) It is delivered to the end-user via a computer using standard Internet technology.

(iii) It focuses on the broadest view of learning solutions that go beyond the traditional paradigms of training.

E-learning may be taken as the latest form of distance learning mediated by state-of-art technologies like Internet and World-Wide-Web.

Key attributes of E-learning, as subsumed by the above definition, may be explicitly stated as:

Many-to-many (i.e group) communication

- Any place (place independence)
- Any time (asynchronicity, time independence)
- Text, enhanced by multi-media and
- Computer-conferencing (i.e., computer mediated messaging)

Elements of e-Learning Environments and Technology Infrastructure

Pedagogy. Principles of teaching are well established in traditional methods of Instruction. These principles may generalize to e-learning; however, limited data-based research has been conducted to systematically assess the application of teaching principles to online instruction. Pedagogy includes teaching methods related to the presentation of experiences, engagement of learners, enforcement, motivation, organization of teaching tasks, feedback, evaluation, and curriculum integration.

Assessment. In traditional forms of instruction, teachers collect anecdotal and other forms of evaluative data in addition to the results of formal assessments when making judgments on students' progress. In e-learning, informal assessments are difficult to employ, as assessments must be planned and precisely designed to evaluate performance, to provide feedback, and to be aggregated for grading purposes. Assessment in e-learning is more essential than in traditional instruction due to the nature of the limited opportunities for traditional informal assessment and related face -to-face interaction that traditional instruction offers. It may also be more critical to assess frequently and to target different levels of instruction (e.g., pre- and post assessments tasks associated with activities, instruction, units, midterm and final exams, and task-specific assessments (Dereshivsky, 2001).

Content. Theoretically, the content of instruction should not differ across instructional methodology and delivery systems. However, some content may lend itself more readily to instruction via e-learning (e.g., introductory material). Traditional forms of content need to be researched from the perspective of structure to determine if a broader base of content can be taught as effectively via e-learning.

Instruction delivery. Electronic delivery is the one feature that clearly differentiates e-learning from other forms of instruction. Too often, e-learning is viewed primarily as an instructional delivery system. In reality the delivery element of online instruction makes possible the pedagogy, that is, the methodology of e-learning.

It is the pedagogy that is most significant in e-learning.

Instructional management. Two aspects of instructional management become more important in e-learning than in traditional forms of instruction. These include resources and systems.

(a) to facilitate student management of resources, feedback, and assessment data; and

(b) to enhance instructional management of student performance, resources, formative data or course design, student work, and anecdotal

Standards and policies. Prior to the advent of the Internet and e-learning, academic policies and standards in educational institutions were based on traditional forms of instruction, that is, classroom delivery models. A similar situation of training programs within industry also existed. The features of accessibility, flexibility, asynchronous learning and structure that characterize e-learning result in circumstances that alter the conditions under which instruction and training occur. This changing condition calls for different policies and standards.

Some Fundamentals for Technological Design

The idea of E-learning/Virtual Campus has been sparked off by three major technological developments viz

(i) the **PC** which made computing affordable

(ii) **The Internet**, which made network useful and

(iii) **World Wide Web** which provided means for creating and using hyper-dimensional knowledge structures. The cyberspace, that forms the foundation for the VU, will be built out of three kinds of components viz.

(i) **Computer platforms and the contents they hold**- made of processors, memories, and basic system software. The platforms process, store and interface with cyber space user's environment.

(ii) **Hardware and software transducer technology** that connects platforms interfaces to people and other physical systems;

(iii) **Networking technology** for computers to communicate with one another. The cyberspace consists of a hierarchy of networks that connects platforms.

The learning needs may require information about any part or whole of any of the cyberspace-user's environments and/or contents which may be in the form of graphics, images, audio/video forms, requiring very large storage capacity. Also making the information available to a learner in real time requires large bandwidths. As stated in the beginning an ideal Global Virtual Campus should provide the required knowledge in the language of the learner. Language translators to any spoken language are essential to meet the ideal. However, from the current rate of progress, the transducer technology that interfaces the computers with the physical world seems to be the hardest nut to crack in our efforts to meet completely the ideal of GVC.

II. CHALLENGES IN E-LEARNING

Technological challenges:

The realization of future e-learning environments raises a number of significant technological research challenges that need to be addressed if we are to consider the development of e-learning facilities that meet the needs of users. These can be considered in terms of two key technological research areas.

Developing New Forms of Interactive Learning and Learning community

Interaction, cooperation and community play a central role in the support for learning. The development of future e-learning environments allow us the opportunity to provide new forms of interactive learning experience and new relationships between computer and learner and the formation of new forms of learning community. Key challenges that need to be addressed include:

- New forms of naturalistic and multimodal interface to support learning whether it takes place across a distance supported by a variety of different interaction devices or in a co-located manner.
- New techniques and metaphors to understand and support learning communities that combine both human and computational agents including new models of computer based learning and new forms of augmented cognition.
- The development of new techniques for the design, development and assessment of systems to support distributed transient and mobile communities of learners.
- New forms of support for community memories that ensure the consolidation and preservation of learning along with its originating provenance.
- Personalization techniques that allow users to tailor the learning facilities to meet their individual needs and current activity.

- Techniques to support and promote interaction across and between learning communities including the discovery of new communities.

Developing New Knowledge Facilities for e-learning

Lying at the core of e-learning is the discovery of new knowledge. Indeed the generation, support and maintenance of knowledge provides the foundation of e-learning. The rapid increase in the volume and variety of data within e-learning means that e-learning facilities need to be supported by appropriate semantic services. These services must be able to generate a surrounding semantic context in which learning can be supported. Fundamental research on knowledge systems and services is needed to allow us to develop a powerful set of knowledge services for e-learning. Research that needs to take place includes work on:

New theories and techniques to allow learning and reasoning over uncertain and incomplete knowledge.

- Tools, methods and techniques to support the design, development and deployment of large scale learning facilities.
 - Support for collaboration and sharing across different learning facilities at varying scales including working across personalized learning structures and larger organizational and disciplinary structures.
 - Support for semantic directed knowledge discovery as part of a dynamic learning process.
 - The development of lightweight and incidental knowledge capture techniques to promote lifelong learning.
 - Development of learning support services that can be tailored to meet the demands of different domains and users.
- Many of these issues are shared with the growing knowledge research agendas underpinning the Semantic Web and Semantic Grid initiatives.

Economic, Social and cultural Challenges:

Given the inherently multi-disciplinary nature of e-learning it is not surprising that the technological challenges that need to be addressed to realize future e-learning environments are mirrored by equally demanding set of economic, social and cultural challenges. E-learning is recognized to be of significant strategic importance by the INDIA government but concerted and co-ordinate political action will be needed to achieve the combined agendas of lifelong learning, widening participation, e-Government and active citizenship in the 21st Century. Yet there continue to be major practical difficulties that are rooted within societal and economic concerns that must be overcome. For example, the INDIA 'digital divide' remains a problem - women, people aged 55+, those not in work, those from social classes C2DE, and people without formal educational qualification continue to feel disconnected from our increasingly connected vision of the future. This set of challenges can be considered in terms of two broad themes.

Understanding and developing a sustainable economy for e-learning

The economics of e-learning are increasingly coming under some scrutiny and questions are increasingly being asked about the place of e-learning within higher education and the relationship e-learning has with other core activities. Given the significant set-up costs associated with e-learning, research is required to study the implications for working capital and the overall structure of many of our existing educational institutions. This issue is amplified by the growing use of mobile and ubiquitous technologies and the questions these ask of the spatial environments within which we situate our learning experiences.

Essentially, what form should our future schools and universities take?

Research is required to inform Government policies related to physical infrastructure, educational funding, intellectual property and data privacy. In consulting the INDIA research community, a number of research questions emerged including:

- How does the efficacy of ICT investment vary according to different subjects and for students with different characteristics? (e.g. age, gender), also according to school/college or teacher/tutor characteristics?
- Is current ICT investment cost-effective? How could it be made more so?
- In what ways will e-learning ameliorate or exacerbate the digital divide? Can e-learning help to challenge existing social relationships or will it merely replicate or reinforce them? How might e-learning be developed to benefit marginalized and disenfranchised communities?
- How is industry and academe to respond to the challenge of increased application of free and open source software?
- How do we respond to the apparent mismatch between e-science and GRID developments and legal frameworks to protect an individual's personal data (Data Protection Act, Health and Social Care Bill, etc)?

- How do we move to a society in which the general public are research aware and enabled to positively control access to their data for research?

Understanding the social and cultural setting for e-learning

As a research area e-learning is by its nature multi-disciplinary and covers a vast range of research topics, ranging from those that focus more on the technologies through to wider socio-cultural research questions and issues concerned with the impact of technologies on learning and teaching, professional roles and identities, organizational structures and associated strategy and policy development. Current e-learning research brings together pedagogical, technical and organizational concerns within a wider set of socio-cultural factors which inform and influence the research agenda. Understanding these broader social and cultural issues is of significant importance to the research communities involved in e-learning and will have a significant role in informing future practices. In consulting the INDIA research community, a number of research issues emerged:

- **Interdisciplinary**, and the notion of multiple voices, is a defining characteristic of the area. How do different research perspectives influence the overall area? How do problems in the practice of different disciplines differ in the adoption and use of learning technologies?
- **Access and inclusion**, which includes issues around the widening participation agenda. What are the barriers to inclusion and what are the issues surrounding the nature and extent of the digital divide?
- **Change**, and its relationship to learning technologies. How does change impact upon motivational issues? What are the drivers and rationales for change? What are appropriate strategies for managing and enabling change and mechanisms for implementation?
- **Convergence and interoperability**, which includes exploration of different forms of convergence (technological, pedagogical, organizational, sectoral, institutional, etc). How well do we understand issues of scalability and globalization and the underpinning standards needed to support interoperability? These are complex relationships. A current focus is also on a critique of convergence versus standardization across the technical, pedagogical, human and organizational aspects.
- **Interactivity and social interaction** and in particular the multimodal and social dimensions of interactivity. How does the interactivity of different tools relate to, or impact upon, the nature of the medium? How is interactivity expressed at different levels of organizations, and how have organizational boundaries and functional groupings blurred as a consequence of new technologies?
What potential do the new technologies have to enhance communication and collaboration and in building new communities and networks?

III. RESEARCH QUESTIONS.

Next, we briefly enumerate some of the questions/issues in respect of research in the field of e-learning

In respect of technological infrastructure and learner interface:

1. What are the technological requirements and societal implications of intelligent agent-based learning environments that automatically adapt the learning process to the student's learning profile?
2. What are the technological requirements for interactive multimedia learning environments?
3. What are the technological requirements for wireless audio-based learning Environments?
4. What types of learner interfaces are possible with 56Kb/s modem-based learning environments?
5. What are the security risks for school districts, universities, and corporate training centers by providing server-side e-learning environments?
6. What learner interfaces can be created to take advantage of heads-up displays?

In respect of instructional design:

1. What e-learning instructional design features lead to effective pedagogical practices that accommodate particular learner attributes?
2. To what extent does matching the needs of learners with accommodating instructional design features influence learner performance in e-learning environments?
3. What learning characteristics most significantly enhance performance in e-learning environments?
4. What are the instructional design features that influence effective instruction and the accommodation of learners with disabilities?
5. What types of pedagogical e-learning practices are required to meet the instructional needs of students with language comprehension problems?
6. What are the instructional design limitations of e-learning for individuals with learning challenges?
7. What learner attributes most significantly affect the instructional design of eLearning environments?

In respect of learners performance vis-à-vis learner attributes and instructional design

1. Do learners in an online course with interactive animated equations obtain significantly higher scores in solving equations than students in an online course that presents equations as text only?
2. Is there any interaction between an animated illustration treatment and visual/verbal learning styles on problem-solving ability?
- 3 Do learners in an online foreign language course who engage in target language live discussions anytime and anyplace achieve significant higher pronunciation and vocabulary scores than learners who have only limited access to live discussions?
4. Is there an interaction between access to online discussions and learner level (adult professionals vs. university students) on pronunciation and vocabulary performance?
5. Do students who receive integrated advice in how to sequence and pace the use of learning objects perform better in recalling facts and problem solving than those who receive the same learning objects without integrated advice?
7. Is there an interaction between the use of advice systems and locus of control on recall of facts and problem solving?

IV. CONCLUSION

As per our research findings we conclude that the rapid increase in internet connectivity is an important catalyst for the growth of e-learning. A robust internet ecosystem, with a multitude of local and global players, will help online learning make further inroads. In underdeveloped and developing countries, e-learning raises the level of education, literacy and economic development. If the agricultural industry targeted through E-learning, the growth rate will defiantly increase. E- Learning and E-commerce can be developed through proper investigate and plan of action. It is proved that the developing wave of adaptive learning will help higher education, women, government. E-learning is increasing the percentage of literate population in the total population of India. E-learning plays a vital role in educational development as a wheel of growth in education sector. It is expected that if India and developing countries proceed as joint venture and work mutually on the issue of e-learning, it will be beneficial for the development of educational sector. Through E- learning lot of opportunities can be captured and speedy development will possible. It is expected that if India and Malaysia act as joint venture together work out on this issue for development, it will be beneficial for educational sector.

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