EMERGING TECHNOLOGIES IN DISTANCE EDUCATION: NEW PARADIGMS OF PEDAGOGY IN 21st CENTURY

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ABSTRACT

New developments in technology, irrespective of the fields, is called emerging technology. These have a potential role to play in the field of education and training, especially distance education, to transform it into an interactive paradigm. These can provide education beyond the boundaries of a nation and/or state making it accessible to learners at their own pace. These are instructional means used for effective, productive and interactive teaching learning process.

At present, effective and efficient teaching learning process is potentially possible at any time, any place and in any discipline. It occurs in changed environment with a shift from teacher-centered-teaching to student centered learning. The greater emphasis is on students' activity rather on teachers'. Teachers are required to play new role in new settings. Accumulated knowledge and experience occupies central place, to which students have direct access. Students learn not only by the teacher but also with the teacher by interacting with one another, teachers and institution through emerging technologies. In this article effort has been made to point out the impact and potential role of emerging technologies in distance education.

Keywords: Open University, Distance Education, Emerging Technologies, Information and Communication Technologies.

INTRODUCTION

The 20th century brought a revolution in the field of information technology to impact on teaching learning process. Hussain, I. (2005) stated that it shifted from conventional teacher-centered-instruction to learner centered activity based learning. Education, particularly distance education embraced information and communication technologies to promote collaboration between the peers of learners, faculty, simulated learning environments, electronic books, digital libraries and virtual universities with a global learning environment. Therefore, new learning environments have introduced exciting potential for distance education with new approaches of knowledge creation and dissemination and new styles of learning. Such styles help learners to achieve their study objectives.

The need of the new information and communication technologies-emerging technologies in teaching learning process continues to grow stronger and faster. Use of these technologies can make information age an era of convenience, providing unmatched feasibility for discovering and exchange of information, communication, exploration and interactive teaching learning process.

Emerging technologies may present the instructional material in different ways to create and sustain motivation in the learners according to their respective nature. Haag, S., Maeve, C. & James, D (1998) have divided emerging technologies into four distinctive but interrelated groups. These groups are:

- Emerging technologies for all the senses-include application of three dimensional (3-D) images, multimedia and/or virtual reality. These accelerate the presentation of information to the learners.
- Emerging technologies for Internet explosion-include Internet and related technologies, taking it as standard technology. There are electronic cash transactions and converging technologies for communicating and accessing the Internet, such as Internet telephone and Internet Pcs.
- Emerging technologies for wireless revolution-include global positioning systems and wireless local area networks.
- Emerging technologies for personal life. These

technologies definitely make the personal lives easier. These include intelligent home appliances smart cards and robots.

The characteristics and principles of a technology and its application include replicability, promotion of algorithmic decision-making, enhancement of communication and control. From this perspective it is assumed that technology exists as the totality of the means, employed to provide objects necessary for human sustenance and comfort and serves as a technical method of achieving a practical purpose. It is then possible to successfully, extricate the abstraction of technology from its representing attributes.

1. Use of Emerging Technologies

Emerging technologies, which are used in the field of education and training particularly distance education, are:

1.1. Three Dimensional (3-D) Technologies for Real Sight

Traditionally information display is viewed in two dimensions or pseudo three dimensions. In two dimensions, one can see only length and width. In pseudo three dimensions, shades and shadows are added to create a display that is somewhat realistic. Because, it is not truly three-dimensional, it is called Pseudo. Most personal productivity software packages available today are capable of producing pseudo three-dimensional views of graphs, photos and artworks.

Real 3-D technology presentations of information as commented by Peter, C. (1995, p.70) gives one the illusion that the object one is viewing, is actually in the room with him/her. One can see the depth of image and turn to reflect different angles to see its various perspectives and in some ways understand the density of the object. 3-D technology is turning up in a number of areas such as medicine, movies, video games, data visualizations, science, education and many others.

3-D technology has incorporated into other types of information technology system. For example, a number of web sites include 3-D representations of photos and the number is growing. 3-D can allow the learners to get a real-life view of classrooms.

1.2. Automatic Speech Recognition-Conversing with Computer

People and computers have been engaging in normal conversation. First the computer captures and understands the words of the person; second the computer generates speech in response to the words spoken by the person. For this to occur, two systems of information technology are needed, one for each phase. The first phase is referred as automatic speech recognition and the second phase as systemization. Of the two, automatic speech recognition is the real emerging technology that promises changes according to the students entering information and command. In automatic speech recognition (ASR) system, not only computers recognize spoken words, but also distinguish word groupings to form sentences.

1.3. Multimedia

Multimedia is hardware software concept of information storage and distribution by computer systems. Dede, C. (1996, p.18) stated that it is "the simultaneous presentation of information through many forms of media that one can control". Multimedia is a valuable source of information in sight and sound.

Multimedia is the latest and the most dynamic trend incorporated in education and training. It can present the information in different forms. According to Romiszowski, A.J. (1996, pp.132-133), "Multimedia is that all forms of information, whether visual, graphic, moving or auditory which are stored digitally in one format and can therefore, be very conveniently mixed for alternative presentations under computer control"

This definition has several implications as pointed by Dennis, V. (1994); first is, multimedia is a combination of content (information) and software (how one controls the presentation of the information). Second, multimedia encompasses many forms of media for presenting information text, graphic, images, sound and video (which can be animated). Third, multimedia can present information through various forms of media simultaneously that is one can look on the screen and potentially read text, watch a video and see a drawing, all

the while listening to some form of narration. In education and training, multimedia represents a whole new way of storing, accessing, processing and presenting information in a variety of environments.

1.4. Virtual Reality

Virtual reality is a new technology that places one virtually in any experience. It is three dimensional computer simulations in which one can actively participate. According to Roblyer, M.D. et al. (1997, pp.242-243). "The term virtual reality coined in 1974 refers to a relatively new technology also called virtual environments, virtual worlds, artificial environments, artificial reality, and cyberspace. At the most basic level, VR is a new way to present three-dimensional images. In its most elaborate form, VR permits a complete simulation of reality or even the generation of a new reality". Virtual reality incorporates 3-D technologies over a real life illusion. Special input devices capture one's physical movements and special output devices send physical responses back. This feature truly distinguishes virtual reality from other types of technology. According to McConnaughey, J. (1996, p.39): Virtual reality applications are incorporating in every field of human activity. The more common and important application of virtual reality is in the field of distance education and training. Many distance-teaching institutions are exploiting virtual reality to create numerous simulated environments". Students can learn complicated concepts more attentively in virtual situation like real ones.

2. Emerging Technologies in Distance Education

Distance Education is a flexible and interactive form of education. Kirschner, P. (1999, p.81) stated that it is, "mediated experience where the specific aim is the intentional acquisition of knowledge, attitudes and competencies". However, distance education has multi dimensional aspects. Bates A.W. (1995, p.11) pointed out such aspects that distance education is going through a shift "guided independent study to interactive or networked multimedia education and following a more flexible, interactive (constructivist) paradigm for learning within learning communities". It is open, flexible collaborative based ICT of education. The technology that are involved in distance education are discussed in detail in the following section.

2.1 Computers

Among emerging technologies, computer may be regarded as the core and fundamental device. In education, it may be used as a multitasking electronic device operating as major communication medium, warehouse of knowledge and information dissemination. Distance learners may use computers for various purposes in different ways and styles with its advanced applications.

2.1.1 Computers in Education

Computer technology has taken over the field of education. It is a jump from traditional teaching, reliance on textbooks to the computer and computer networking over the Web. The computers may serve a dual purpose of exposing the learners to modern technology and inculcating them into a new and scientific approach of learning.

Gallo, M.A. & Neno, R.B. (1985) stated that optimum learning takes place through individualized form of instruction, in which lessons are designed for the learners under the guidance and tutelage of a tutor. Obviously, in the present student teacher ratio individualized instruction might be unrealistic. To achieve individualized learning, students learn by computers through programmed instruction developed from the theories of B.F. Skinner.

While learning through networking and conferencing, the learners will be motivated to become self-directed-learners. Brocket, R.G. & Hiemstra, R. (1991, p.165) stated that: Self-directed learners may, in fact, benefit the most from access to increased information and improved retrieval systems assuming that they have access to the systems and know how to use them. However, educators and learners will need to find ways to help such learner's access and effectively utilize appropriate information.

The individualized phenomenon is based on empowerment of learners through a loosening of dependency on teacher.

Computers can create classroom situation for distance

learners. They can actively participate in their lessons and interact with faculty through Local Area and Wide Area Networks of computers (LANs and WANs). Computers can provide opportunities for self-directed learning, as Hitlz, S.R. (1990, p.63) supported, the efficacy of such instruction for self-directedness by giving his views "results are superior for well-motivated and well-access to necessary equipment. Those students also take advantage of the opportunities provided for increased interaction with their professors and other students and for active participation in a course". This interaction between student-students, student-tutors is conducted through WANs and LANs.

2.1.2 Computer Assisted Instruction (CAI)

According to Das, R.C. (1993, p.191) "providing programmed instruction through computer is called Computer Assisted Instruction or briefly CAI". Learners can learn individually from the computerized instructional materials, presented in an objective and logical way to the learners. CAI is the use of computer to provide course content instruction in the form of drill and practice, tutorials and simulations.

The main aim of CAI is to provide individualized instruction to the individual learners to meet their special learning needs. Once the instructional materials are computerized, the learners can learn individually at the computer terminals. One computer can have several terminals and a large number of learners can learn simultaneously from one computer.

Das, R.C. (1993) described that Programmed Logic for Automatic Teaching Operation (PLATO) project at University of Illinois used a very large computer controlling upon 4000 terminals. At the University of Stanford, SUPPES developed a number of courses for use in CAI approach.

Similarly, various other universities in developed and developing countries are using computers in different ways. Iqbal, M.J. (1999) identified some uses of computer in education. These include computer assisted test delivery, grading & analysis, item analysis and item banking.

2.1.3 Computer Supported Collaborative Learning

Computers can be used for problem solving. In this perspective Litteton, K., Light, P., Joiner, R. & Barnes, P. (1992) conducted experimental study involving 120 persons, aged 11 and 12 years, working on computer-based problem solving task in an adventure game format. The game was implemented in HyperCArd 2 on the Macintosh Computer. The scenario drew upon elements of familiar children's stony/sony and a contemporary T.V. advertisement aimed at children. The task was specially designed computer based route-planning task. As a result of this experiment, there was some significant advantage for pairs over the individual in the second session of the three sessions. However, there was no advantage at individual post-test. Boy's results were slightly better.

Similarly, Ward, M. & Newlands, D. (1998) compared the relative effectiveness of three versions of hypermedia systems, namely, Text, Sound/Text and Sound. The results indicated that those working with sound could focus their attention on the critical information. Those working with the text and sound/text version, however, did not learn as much and stated their displeasure with reading so much text from the screen.

Similarly, Agarwal, J. (1987) pointed out its success as medium of instruction by evaluating the Computer Literacy and Study in Schools (CLASS) Project in India. In the first phase of the CLASS Project during 1984-85, 250 schools were selected for participation. The Indian Space Research Organization (ISRO) Ahmedabad undertook a comprehensive evaluation of the pilot state of this project. The evaluation report was encouraging in the sense that students were found to be enthusiastic in learning computers and to use them for learning other subjects.

Moreover Zehavi, N. & Rosenfeld, S. (1996) also acknowledged the effective use of computers in the junior high schools of Israel. The achievement of the project indicated that students from different ability levels actively and enthusiastically integrated the technology into the process of working on their science and technology projects. Totally,105 students (20% of the

school's population) produced 67 projects. One of the findings of this assessment was that 76% of the participating students used computerized tools in the preparations of their projects, i.e. word-processing (40%), graphic design (15%), spread-sheet (15%), and other tools (6%).

Zehavi, N. & Roserfield, S. (1996) further say that evidence for the shift in attitude is demonstrated by the questionnaire administered before and after the Science and Technology Fair. Before the Fair, about 60% of the teachers agreed that computers should be used as reinforcement for the good students while only about 40% agreed that computers should be used as assistance for weak learners. After the Science and Technology Fair, the assumption was reversed. About 40% agreed hat computers should be used as reinforcement for the good students while about 60% agreed that computers should be used as assistance for weak learners. This indicates that the use of computers in education is increasing day by day and it has proved to be successful medium of instruction almost in every country of the world.

United States of America is a technologically advanced country and is using computer in every sphere of human activity. Hamza, M.K. (1998, http://ww.index. Html /authorindex. htmlauthor/hamza) pointed out that in 1983, the ratio of students to computers in American Schools was 125:1. By 1990 the ratio decreased to 20:1 and by 1995 it reached to 9:1. Conversely, other technologies were adopted almost at the same rate. Between 1991-92 school years, only 7% of schools had CD-ROM drives. The number increased to 37% by 1994-95 school years. In 1991, only one percent of the nation's classrooms had satellite connections, while 17% had it three years later in 1994. About 53% of all school districts survey reported that at least one school connected to the Internet in 1993-94 academic year and 37 states provided network accounts to some 509,000 users in 1995. Access via computer modem and telephone connections accelerated rapidly in the past few year featuring e-mail connection to the Internet.

2.2 Internet

The potential use of computers as described by Hafzallah, I. M. (1999) is to link people together and to provide them with access to information when they needed, led to the development of Internet. The Internet revolutionized the conventional way of storing, accessing, sharing and distributing information.

Internet is widely used in all spheres of human life, but in education it is in a state of accelerated momentum. It enhances the teaching learning process and facilitates the researchers. The use of Internet provides learners opportunity of interaction with available information to fellow learners and instructors, who are all electronically communicating with them (http://csssrvr.entnem.edu/).

The use of the Internet updates the instructional pedagogies and makes the information/knowledge bank available to the learners at their own command (Moore, D. 1996). It eliminates the gulf between the learners and instructor providing a global interactive learning environment. The Internet (Ely, D.P. 1996, http://www.eus.wsu/edu.uidaho-edu/tddda.) promotes distance education through cyber courses. Through the World Wide Web, instructors can electronically deliver all types of material through asynchronous delivery. Cyber courses create an electronic learning environment where the distance and institutional barriers are disappearing.

The Western Governors University (WGU) is a good example of its application. WGU (http://www.eus.wsu.edu/.) is an alliance of over 30 universities and colleges that have agreed to contribute instructional courses. WGU students living anywhere in the world can choose and complete courses from any of the participating institutions. The Tri-State Agricultural Distance Delivery Alliance is another example of similar nature.

The development of cyber courses by professional education companies is at competitive stage. The Florida Community College System announced the purchase of a commercially produced introductory chemistry cyber courses to be used by all the students in the state (http://www.distancelearning.com.html).

These courses can incorporate advanced media and

allow students to explore the materials in a more investigative and less linear manner. It encourages students to be less passive and more active in the learning process. Cyber courses involve the students in the learning activities and their active participation results in effective learning.

Kennedy, D. & Agnew, D. (1998) said that Cyber courses are not only asynchronous, but also they allow the utilization of all currently available media and provide an effective means of communication. These courses can also be offered to students attending institutions that lack expertise in a particular area. On-line students can access experts from other institutions and even from the private enterprise as well.

The availability of the Internet technology has proved to be medium of instruction that ideally is the need of distance learners at present. It has potential to be the access equalizer. Using Internet, all the learners can have access to the digital libraries and the most up-to-date information available.

2.3 Web-Based Learning

Learners may have greater control over their learning on the Web. There may be greater retention on a well-designed system as students interact with the information in self-directed learning environment. The World Wide Web operates in close relation with human brain in processing the information. Gonzalez, J. (1998, p.110) stated: The human mind operates by association. With an item in its grasp, it snaps instantly to the next that is suggested by the association of thoughts in accordance with some intricate web of trails carried by the cells of the brain. It has other characteristics, of course, traits that are not frequently followed are proven to fade, items are not fully permanent and memory is transitory. Yet the speed of action, the intricacy of trails, the detail of mental pictures, is awe-inspiring beyond all else in nature.

Gonzalez, J.S. (1998) further explained that, while learning, people often switch quickly from one question or request to another. Internet-based performance support enables learners to switch quickly from one piece of information to another, until their inquiry is satisfied. Web-technologies can create an opportunity of changing from traditional, formal, structural and classroom based-training to continuous knowledge sharing.

The research scholars are also getting benefit from the use of Internet and its achievement has the significant importance. Buthun, G.D. (1998) discussed its effectiveness in learning through distance education. It was experienced at the University of Oregon where for two-and-a-half years, the University of Oregon had offered four ten-weeks distance education classes including Physics, Energy and the Environment, Alternative and Renewable Energies, Astronomy, Solar system Geology, Cosmology and the Origin of Life. About 150 students from around the world had taken these courses.

Its achievement indicated that among the 150-distance education students enrolled in the four courses, 125 students completed the requirements in eight to ten weeks. This proves that it is possible to deliver courses over the Web. Such courses require little students' monitoring and allow them to work at their own pace.

Similarly, Edelson, P. & Pitman, V. (2001) have given the achievements of Internet at Indra Ghandi National Open University (IGNOU) which launched online exams for CIC, BCA and MCA programmes in July 1998. Internet was also used to act as a medium to provide different services supportive to the learners, including counseling and guidance in preparing assignments. A learner was assumed to have easy access to Internet. The University created Internet Access Points (IAPs) for those who did not have easy access to Internet.

But, generally it was found that learners did not go through the information material provided by the University and depended on other live resources to get information. Another important aspect, which is obvious from the evidence is that most of the learners were not computer literate, yet they were easily benefitted from Internet.

Likewise, Sherry, L. (1996) pointed out that the University of South Florida has set up a mentoring system and an on-line discussion for participants in the telecommunications' course. Athasbasca University assigns ten students one mentor for ten students in the Master of Distance

Education Programme. The University of Wisconsin uses audio-conference seminars to link instructors together. The University of British Columbia uses teleconferencing and telephone tutoring systems for teaching learning purpose. Georgia College has an electronic Bulletin Board System (BBS) with on-line resources, electronic conferencing and a teachers' clearinghouse for contacting other teachers interested in telecommunications.

2.4 Educational Television

Educational television denotes any television used for education of the community. It includes both instructional TV programmes and community TV programmes. According to Karim, S., Kamal, S.A. & Islam, M.M. (2001) television is used mainly as an instructional medium to present information, ideas and experiences in any subject and at any level. Television has been in use for developed, industrialized and developing countries of the world for educational purposes. It holds fascinating opportunities for the world of education. It has opened new vistas for instructional media to meet the problems of shortage of school facilities for ever growing school population. It helps poor countries of the world where school-going population is quite large and there is acute shortage of qualified teachers, well-equipped laboratories and other necessary infrastructure. It can also reduce the mounting cost of education.

According to Pavlik, J.V. (1996) television as a versatile and dynamic communication medium is being utilized increasingly in developed as well as developing countries of the world to meet the growing demands of education and to improve the instruction.

Hiebert, R.E., Ungurant, D.E. & Hohn, T.W. (1988) stated that unlike the radio broadcast, television has the added advantages of all the important visual experiences, which is made more dynamic and meaningful by the movement and sound associated with the visual experience. It has the potency to inform, entertain and educate. It can communicate comprehensive views mixing with different stimuli. It is an effective medium for education reaching out largest number of people. It has become a major instrument of education as well as significant component of distance education and alternative systems for various categories of learners.

Hiebert, R.E. et al (1998) has pointed out that educational television may be used for (i) improving quality of education, (ii) bringing social equality in education, (iii) extending students experience, (iv) reducing dependency on teacher, (v) using the best available teacher, (vi) meeting the changing needs of education, (vii) improving efficiency and productivity, (viii) minimizing cost of education, (ix) stimulating educators, (x) controlling stimulation and (xi) facilitating distance education.

Because of these benefits, the Virtual University of Pakistan delivers education through its educational television. Presently, it is imparting instruction through its Virtual Television Channel-1 and Virtual Television Channel-2. Similarly, Allama Iqbal Open University Islamabad is also offering televised instruction for its students at various levels.

2.5 Telecommunication

The use of computers' networks and telecommunication services to impact on distance education and human resource development activity is relatively new. It is learner based support system, the main focus of which is the active participation of learners in teaching learning process. Hiemstra, R. (1996) justified the use of telecommunication in education and stated that increasing number of adult learners, growing training demands in business, industry & various service organizations and expanding developmental requirements at various levels are demanding to reach a large number of people at a distance. Therefore, Universities are compelled to use telecommunication (teleconferencing and/or videoconferencing) to promote teaching learning process.

The Ohio State University Centre on Education and Training for Employment (1990, p.1) examined the results of computer conferencing pilot training activities and reported that, "...computer conferencing does work. Specially, it breaks up the monotony of sitting in the

classroom, enhances communication among people who may not interact otherwise, offers immediate feedback to responses and questions, saves time and expenses by reducing travel, provides a printed dialogue as a reference, tightens the structure of the course and provides concise information and demonstrates the potential of networking to students".

These characteristics are enhancing the importance and number of computer mediated-conferencing courses. Harasim, L. (1987) described a successful use of computer conferencing in graduate level courses and concluded that "the computer mediated-conferencing approach is an effective instructional delivery system with potential, both qualitatively and quantitatively different, and in many cases better learning experiences than that of the traditional classroom".

Various types of conferencing have been used in the teaching learning process. For example computer mediated-conferencing is successfully used in higher education. Likewise, Hiemstra, R. (1996) mentioned that the University of Colorado used computer mediated-conferencing to offer an extension course on the "office of the future" to managers. Similarly, the New Jersey Institute of Technology uses a computer conferencing system for several courses on management and in other areas.

Moreover, colour videoconferencing is being used to promote teaching learning process as pointed out by Winders, R. (1988) who stated that full motion colour videoconferencing requires either satellite or multiple channel cable capacity. Most videoconferencing uses the international system of satellites' communication available for business, entertainment and education throughout the world. It creates face-to-face classroom environment. Satellite transmission has been used in USA for dissemination of video-learning materials and for two-way video-conferencing in professional updating of engineers. The launch of a European Direct Broadcasting Satellite in 1989, with educational channels created International exchange in learning materials. Professional updating through distance education is a major area of application of emerging technologies including audio/videoconferencing.

Japanese Universities are making use of video links in teacher education. At Okayama University, a permanent link with a local school enables a tutor to illustrate teaching styles to students by selecting an ongoing class for remote observation.

Romiszowski, A.J. (1996) found that in a survey of user reactions to several forms of telecommunications based instructional systems, participants commented that they had never listened as intensely and never gained as much from a discussion as they had from their first experience with audio teleconferencing and telelecture.

Achievement of computer-mediated tele-seminar has great significance in nursing education through distance approach. Sumners, A. (2000, http://www.westga.edu/distance/tronsgard24.html) described that nursing has used distance learning to provide education in the United States and Europe. Nursing faculty from two International Universities, University of Northumbria (UNN) at England and North Georgia College and State University (NGCSU) in United States initiated a collaborative project using desktop videoconferencing (DTV). The eight-week project was designed to investigate Women's Family Centred healthcare Systems in both the countries. The student's enthusiasm and positive faculty evaluations suggested a similar project be designed and offered in the future.

Conclusion

Emerging technologies have greater impact on teaching learning process. These have taken over the field of education in general and distance education in particular. It is a jump from traditional teaching, reliance on textbooks to the computer and computer networking over the Web. These serve a dual purpose of exposing the learners to modern technologies and inculcating a new and scientific approach of learning.

Progress in information and communication technologies has accelerated distance education at present. Distance education has transformed in terms of its design and delivery. It is becoming a much more common and viable alternative to the conventional classroom-based

model of instruction and within conventional context, many unconventional teaching and learning strategies, based on the exploitation of emerging technologies are being implemented.

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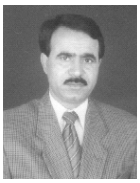

Irshad Hussain is working as Lecturer in the Department of Education, the Islamia University of Bahawalpur, Pakistan. He did M.Phil and Ph.D in Distance & Non-formal Education from Allama Iqbal Open University Islamabad, Pakistan. His research area at Ph.D level was to study the impact of emerging technologies on teaching learning process with reference to distance education. The main areas of his interest are Distance Education, Adult and Continuing Education, Emerging Technologies, Professional Development and Teacher Training Programmes through Distance Education.
He has worked in impact studies for ADB, GTZ, UNESCO and NCHD in the area of Adult Education, Literacy and Primary Education. He is Assistant Editor of Asian Journal of Distance Education (Online). He is member of the International Reading Association (IRA) USA, Pakistan Reading Association (PRA) Pakistan and Allama Iqbal Open University (AIOU) Islamabad (Member Course Team & Tutor and Research Supervisor at Master & M.Phil level).