A Review of ICT Technologies in Higher Education

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ABSTRACT

ICT offers a new perspective to Higher Education; its potential however remains under utilised. This paper explores modes, types and medium of technologies in Higher Education. It also explores how new technologies can be used effectively in digitally equipped future class rooms and also addresses the difficulties in their usage and provides suggestions for their judicious use in Higher Education.

Keywords: ICT, Web based communication, Twitter, Face book, Blogging, Micro blogging, e-technology, Podcasting, Virtual environment, Teleconferencing, Online Education, virtual classroom

Information and communication technologies (ICT) involve, in the most general sense, the use of technology in managing and processing information. More specifically, ICT can be defined as the use of all conceivable digital media in managing and processing information in the digital classroom. Since knowledge is vital, it follows that the acquisition of knowledge must be life-long. The Delors Commission describes learning throughout life as the "heartbeat of society". But how does one keep pace with this rapidly changing world? The answer is obvious – through ICT. ICT enabled virtual spaces provide "anytime, anywhere" access to reliable and authentic information; ICT can universalize education for masses in the truest sense.

To quote the National Curriculum Framework (NCF) 2005, "ICT is an important tool for bridging social divides. ICT should be used in such a way that it becomes an opportunity equalizer by providing information, communication and computing resources in remote areas". The present paper explores the use of ICT based technology spaces in the future digital classrooms. It also gives suggestions on how we can use ICT based technologies judiciously and manage it in the digital classroom.

ICT and Education

As compared to a conventional/ traditional classroom teaching, ICT facilitates construction of knowledge by providing students with experiences that are otherwise expensive, time-consuming or simply impossible to provide. Studies also show that ICT motivates students and energize classrooms. They force the teacher to look beyond the textbook and traditional methods, and enable students to develop good study habits and a spirit of knowledge sharing.

A review of the literature on integration of ICT suggests multiple benefits such as multiple senses are involved in the classroom, real environments are simulated, material can be presented holistically, and independent learning takes place within the class group. ICT use in the classroom is at two

levels, first to collect and analyse data, prepare reports, submit assignments, and so on and second to support the teaching-learning process through the creation of appropriate environments. In this manner, not only is learning enhanced using ICT, students also acquire skills in using ICT resources. Interestingly, students in the UK are also evaluated academically and behaviourally using ICT which suits the content.

The Web-Based Education Commission 2000 appointed in the USA stated in its report 'The Power of the Internet for Learning' that web-based learning environments can provide support and challenge through multiple means of representation.

The National Curriculum Framework 2005 states that the psychological impact of ICT and the potential they offer for global sharing of knowledge cannot be denied. It stresses that ICT should be used to enhance learning for all parts of the curriculum to enhance inter-disciplinary and cross-disciplinary thinking. It further stresses that opportunities for professional development in this area be provided to teachers so that they can effectively perform the role of facilitators, thus allowing students to learn independently.

A study on the use of ICT in education in India as assessed by a meta-survey conducted by UNESCO reported that India actively promotes the use of ICT in education in both formal and non-formal education sectors. This varies from the use of radio to facilitate the green revolution, to satellite-based, one-way and interactive television for rural development in some of the most backward districts to open and distance learning models. At present, the use of newer computer and Internet based ICT resources for education, along with broadcast ICT is being explored.

A number of private players are also involved in the incorporation of ICT in education. Intel has an international project called Applying Computers in Education, which is involved, in training teachers in the integration of computers in education. Computer-based learning material is being prepared not only by government agencies but also private groups. The Internet has a plethora of material, mostly posted by individuals, which can be used to support and enhance teaching learning.

ICT in Higher Education

With emerging new technologies, the teaching profession is evolving from an emphasis on teacher-centered, lecture-based instruction to student-centered, interactive learning environments.

Care should also be taken to introduce, incorporate and educate contemporary technologies to the teachers as well as students for their proper utilization. A future classroom in this manner will enable its users to learn in the most productive environment, with virtually no boundaries and having connections with the outer world with any student, teacher, school, university anywhere in the world.

For education to reap the benefits of ICT in learning, it is essential that students and professionals have basic ICT skills and competencies. Therefore Designing and implementing successful ICT-enabled Higher Education programmes is also one of the key to fundamental, wide-ranging educational reforms. Higher education institutions may either assume a leadership role in the transformation of education or be left behind in the swirl of rapid technological change. They must also provide leadership in determining how the new technologies can best be used in the context of culture, needs, and economic conditions within their country.

ICT in Higher Education is not merely developing ICT skills and competencies. It involves developing in the students the ability to continuously update them, to ascertain the kind of ICT that is suitable for the learning experience to be provided, and to use ICT to optimize the processes of education. To achieve these objectives, students and teachers should not only have a working knowledge of ICT resources and the ability for self-learning where innovations are concerned, they should also be exposed to ICT-supported learning environments during their training.

Higher Education institutions and programmes must provide the leadership for pre-service and in-service teachers and must model in the new

pedagogies and tools for learning. They must also provide leadership in determining how new technologies can best be used in the context of culture, needs, and economic conditions within their country.

The NCF 2005 perceives the use of ICT as serving to build a positive ethos for curricular reforms if they are used as sites of discussion and debates in which teachers, training personnel and community members can participate. Teachers require first-hand experience of making programmes in order to develop an interest in the new technology.

ICT IN HIGHER EDUCATION: THE FOREIGN PERSPECTIVE

The Web-Based Education Commission 2000 appointed in the USA stated in its report 'The Power of the Internet for Learning' that web-based learning environments can provide support and challenge through multiple means of: Representation (e.g. a math concept in both text and graphic modes; animated science simulations; poetry read aloud by the author; etc.); Expression (i.e. use of text; sound; images; video; and combinations of media as vehicles for expressive literacy through writing, illustrating, speaking, video-making, and drawing); and Engagement to attract the easily bored or the easily distracted learner'.

UK Teacher Training Agency specified in 2001 the role of the teachers in the Internet age as: When, when not and how to use ICTs in teaching their subject; how ICTs can be used for teaching the whole class; how ICTs can be used when planning, including the use of ICTs for lesson preparation and the choice and organization of ICT resources; how to assess pupils' work when ICTs have been used; how ICTs can be used to keep up-to-date, share best practice and reduce bureaucracy.

Both in the UK and USA, which have detailed standards regarding ICT in education, student teachers have to demonstrate a specified competence for accreditation and certification of the teacher education institutions. Since 1989, the teacher education programme in the UK has an ICT component in the mandatory standards for pre-service teacher training. The pre-service training must have a compulsory orientation to the effective use of ICT in the classroom while providing a sound basis for their subsequent development in the field. They should not only be able to evaluate the ICT resource but also be able to assess the changes its use brings about in the teaching-learning process. In most other European countries, the teachers' grasp of ICT skills and competencies is stressed as much as their mastery of ICT for teaching purposes.

China is currently developing an 'e-education approach' for promoting the professional development of teachers with the support of ICT. The concept of e-Education involves networking of teachers for reflective exchanges and sharing of experiences, the construction of digital learning environments, and facilitating the integration of ICT in the curricula by having students develop technology-integrated instructional plans from the content they will be teaching in institutions. We can conclude from the above discussion that the ICT technologies are more frequently and systematically integrated in teaching and learning in Higher Education in foreign countries as compared to India.

Emerging Technologies/Services in Education

The new technologies, which are in use today, and need to be explored to understand how to use them effectively and with least hindrance in Higher Education programmes are summarized in the table 1.

All these new technologies / tools need to be explored for their possible use in Higher Education. These new services open new possibilities in performing researches and finding their impact on teaching learning through e-education programmes.

DISCUSSION

ICT alone cannot optimize the teaching and learning. What determines the benefits of using ICT is how it is incorporated in the teaching-learning process. Since it is ideally the teacher who creates the environment in the classroom, it follows that the teacher should be aware of ICT resources that can be

Table 1: A matrix of modes, types and medium of technologies

Mode	ICT based Technologies	Medium			
		Text based	Image based	Audio based	Video based
Asynchronous	Instant Messaging	☐			
	Text Chat	☐			
	Podcasting			☐	
	Videocasting				☐
	Internet Forums	☐	☐		
	Wiki	☐	☐		
	Web blog	☐	☐	☐	☐
	Micro blogging	☐	☐	☐	☐
	Social Book Marking	☐			
	Social Networking	☐	☐	☐	☐
	Really Simple Syndication (RSS)	☐	☐	☐	☐
	Learning Object Repository	☐	☐	☐	☐
Asynchronous	Virtual classrooms	☐	☐	☐	☐
Synchronous	Educational Apps	☐	☐	☐	☐
Synchronous	Web conferencing	☐	☐	☐	☐

used to enhance learning amongst students, aware of innovations in the field, be comfortable using the resources, be able to evolve as the resources evolve, be able to instil the appropriate comfort level in the students, be able to assess students' learning in ICT-supported environments.

There is no dispute in the fact that ICT based technologies need to be integrated in Higher Education. In other words, an understanding of ICT as well as of the pedagogical use of ICT based technologies needs to be included. While students have to be trained in using these technologies, they also need to be trained regarding situation in which they should be used in teaching-learning. A set of criteria needs to be developed and validated regarding which ICT resources should be used in the teaching-learning process and when. It is axiomatic then that higher educators themselves need not only be competent in the use of ICT but should continuously update themselves and keep evolving as technology evolves. Educators who are already working on ICT based technologies need to frequently update their knowledge and get oriented to innovations in the teaching-learning process. Various aspects in which ICT can play a

role are: developing ICT skills and competencies in student; future educators must be trained in locating appropriate resources; developing attitudes that facilitate use of ICT in the teaching-learning situation amongst student teachers; facilitating continuing Higher Education and professional development; building collaborations with other institutions and facilitating the same amongst; individuals for sharing of innovations and resources.

With ICT, the very meaning of pre-service Higher Education can change drastically. From being a formal, organized activity, in-service training can be a continuous process, with teachers being required to complete a number of modules over a specified period, with the flexibility of choosing how to space out their learning.

Since the community plays an important role in the educational process, collaborations between the community and institutions can be mediated through ICT. Student teachers will then need to be oriented to this aspect of their future responsibilities. ICT must be a part of and not apart from transactions in the classroom. ICT must find a place in the core curriculum of Higher Education, not necessarily in the form of ICT based competencies but as an

ever-present option for enhancing the teaching-learning process. Faculties must make use of ICT-rich learning environments that can serve as models for the student. They also need to develop e-curriculum in addition to the curriculum they transact during training in programmes. Only when students see and experience these learning environments will they be able to incorporate them into their classrooms.

One can say that ICT can replace the teacher and the environment since ICT can adapt experiences to the needs of the learner while providing a ICT based environment. However, in all this, the importance of traditional media cannot be underrated. ICT and traditional means of learning need to be complementary and supplementary to each other. Dissemination of learning material can be through ICT and supported by ICT.

ICT in Higher Education should not be just another module to be completed for obtaining the degree; it should be integrated into the pedagogy courses and also in each of the core courses. The psychology component should inform student teachers of how ICT affect learning. The philosophy component must speak of how the queries that have plagued humans over the ages have now changed with the co-opting of ICT in the creation of the global village the world is today. Sociology of education must grow to include the change in interactions with the increasing use of ICT – the changes in classroom dynamics and the alterations in social relations. Whenever student teachers learn of activity-based curricula, of individualized learning, of multisensory perception, they must also be aware of the role ICT can play in each of these.

Suggestions

Higher Education institutions can undertake the following to equip their students to use ICT both in the classrooms and for continuing self-development:

- expose students to ICT resources and give them all a basic orientation to and experience in handling them;
- train students in the use of computers for making presentations, reports and so on;

- provide students with model lessons incorporating virtual resources;
- provide students with an orientation to and opportunity for preparing and delivering ICT-integrated lessons;
- encourage and support students in the use of ICT resources;
- ensure continual access to all students;
- develop a library of educational CDs and develop a list of websites with virtual resources appropriate for the discipline they will be teaching;
- keep updating the above by constantly researching innovations in the field and new strategies to use ICT;
- give students an opportunity to use these themselves;
- give students assignments that require them to use ICT resources and have them submit these online;
- continuously assess the student teachers' grasp of ICT and give them immediate, meaningful feedback regarding both their competency with ICT resources and their use of these in classroom situations;
- have the student teachers undertake projects using ICT resources that they will be assigning to their students to ensure that they get a grasp of how to not only support their future students but also to evaluate them;
- develop appropriate evaluation strategies for both competency in and use of ICT resources;
- provide the student teachers experience of online classrooms, web-conferencing and other such ICTs for collaborative learning and sharing of resources;
- provide the student teachers experience in creating their own web pages;
- provide the student teachers compulsory the effective use and exposure to use of technology in real life related to their pedagogical courses;
- explore all new emerging services and tools which are now available on the net for future teaching in digital classrooms;

- virtual world also needs to be used in teaching higher courses;
- the Higher Education Curriculum must provide them ICT interactive environment during pre-service programme.

CONCLUSION

To conclude, the use of ICT based resources develops reflection, collaboration and autonomy amongst learners. There cannot be a more fitting testimony to the need for incorporating e-Technologies in Indian classrooms – and the way to do this is through and by the Higher Education. The time has come to explore the use of these platforms/services in Higher Educational programs as well to explore how we can educate the masses through these technologies.

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