Convergence of ICT and Education

Raju Kumar

Abstract—Information and communication technology (ICT) has become, within a very short time, one of the basic building blocks of modern society. Many countries now understanding the importance of ICT and mastering the basic skills and concepts of it as part of the core of education. Organizations, experts and practitioners in the education sector increasingly recognizing the importance of ICT in supporting educational improvement and reform. This paper addresses the convergence of ICT and education. When two technologies are converging to each other, together they will generate some great opportunities and challenges. This paper focuses on these issues. In introduction section, it explains the ICT, education, and ICT-enhanced education. In next section it describes need of ICT in education, relationship between ICT skills and education, and stages of teaching learning process. The next two sections describe opportunities and challenges in integrating ICT in education. Finally the concluding section summaries the idea and its usefulness.

Keywords—Education, Information and Communication Technology, Learning, Teaching.

I. INTRODUCTION

THE use of information and communication technologies in education makes teaching – learning process effective and interesting. To know the impact of ICT in education, we need to know two basic things: ICT, and education.

The *Information and Communication Technologies* (ICT) is an umbrella term that includes any communication device or application, encompassing: radio, television, cellular phones, computer, and network hardware and software, satellite systems and so on, as well as the various services and applications associated with them, such as videoconferencing and distance learning [1]. When such technologies are used for educational purposes, namely to support and improve the learning of students and to develop learning environments, ICT can be considered as a subfield of Educational Technology.

Education encompasses teaching and learning specific skills, and also something less tangible but more profound: the imparting of knowledge, positive judgment and well-developed wisdom. Education has as one of its fundamental aspects the imparting of culture from generation to generation. Education means 'to draw out' facilitating realization of self-potential and latent talents of an individual. It is an application of pedagogy, a body of theoretical and applied research relating to teaching and learning and draws on many disciplines such as psychology, philosophy, computer science, linguistics, neuroscience, sociology and anthropology [2]. In view of ICT, education can be classified in three main categories- E-Learning, Blended Learning, and Distance Learning.

A. E-Learning

Electronic learning or e-learning is a general term used to refer to computer-enhanced learning. It is commonly associated with the field of advanced learning technology (ALT), which deals with both the technologies and associated methodologies in learning using networked and/or multimedia technologies [3]. It is also known as *online learning.* Distance education provided the base for e-learning's development. E-learning can be "on demand". It overcomes timing, attendance and travel difficulties [4].

B. Blended Learning

Blended Learning is the combination of multiple approaches to learning. It is usually used to define a situation where different delivery methods are combined together to deliver a particular course. These methods may include a mixture of face-to-face classrooms, self-paced learning and online classrooms as shown in Fig. 1:
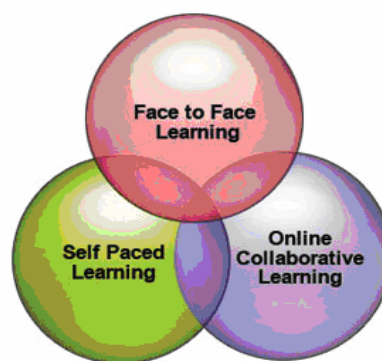

Fig. 1 Blended Learning
(Source: http://www.portal.etqm.ae)

a) Face to Face Learning

Face to face learning refers to learning that occurs in a traditional classroom setting where a faculty member delivers instruction to a group of learners. This could include lectures, workshops, presentations, tutoring, conference and much more.

b) Self Paced Learning

Self paced learning provides the flexibility to learn according to the availability of learners' own time and pace, it occurs in a variety of ways such as: reading specific chapters from text book, studying course material presented through web-based or CD-based course, attending prerecorded classes or sessions, reading articles referred by faculty

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member, working on assignments & projects, and searching & browsing the internet.

c) Online Collaborative Learning

Online collaboration involves interaction between learners and faculty members through the web; this interaction can occur in one of the following modes:

- Synchronous interaction
- Asynchronous interaction

Synchronous, means "at the same time", it involves interacting with a faculty member and other learners via the Web in real time using technologies such as virtual classrooms and/ or chat rooms. On the other hand, Asynchronous means "not at the same time"; it enables learners to interact with their colleagues and faculty member at their own convenience; such as interacting through email [5].

C. Distance Learning

It is a type of education, where students work on their own at home or at the office and communicate with faculty and other students via e-mail, electronic forums, videoconferencing, chat rooms, instant messaging and other forms of computer-based communication [6]. It is also known as open learning.

Most distance learning programs include a computer based training (CBT) system and communications tools to produce a virtual *classroom.* Because the Internet and World Wide Web are accessible from virtually all computer platforms, they serve as the foundation for many distance learning systems.

II. ICT AND LEARNING

In this section, the need of ICT in computerization of educational institutes, relationship between different kinds of ICT use in learning, and model for teaching – learning process are accessed.
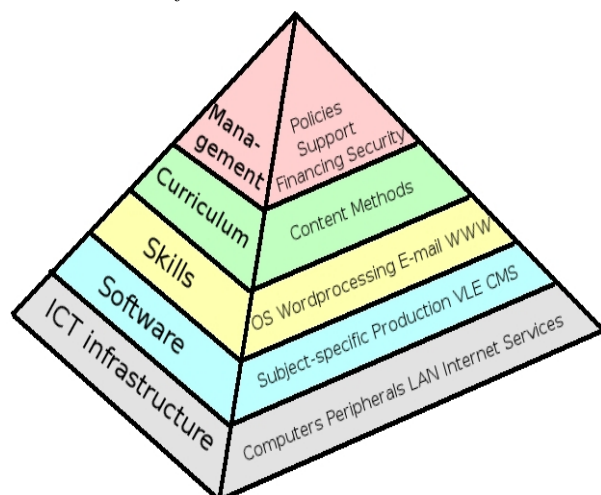
A. Assessment of ICT Need

Fig. 2 Pyramid of ICT needs in education
(Source: http://www.htk.tlu.ee)

ICT needs for successful nationwide institutes computerization program can be described as a hierarchy, as shown in Fig. 2 [7]. The first visible part of the pyramid shows the ICT needs in education and corresponding second visible part of the pyramid hints what are required to fulfill corresponding ICT needs.

- Access to modern and stable **ICT infrastructure** by all teachers and students.
- Multifunctional, licensed *software* tools and services for educational use (including Virtual Learning Environments and Content Management Systems).
- ICT *skills* of students and institute staff.
- Integration of ICT into **curriculum** that provides valid goals, content and methods for using ICT in institute.
- **Management** of the ICT innovation on the institute, district, state and national level.

The hierarchy of ICT needs shown by the pyramid does not imply that the low-level needs (ICT infrastructure and software) should be completely satisfied before high-level needs could be addressed. Suggested approach is to deal with all levels at once, in the systemic, integrated and coordinated manner.

B. Relationship between Different Kinds of ICT Use in Learning

The relationship between different kinds of ICT use in learning is shown in Fig. 3. It shows that ICT skills for IT jobs, derived from a partial subset of those needed for enhanced living and employment opportunities; and ICT skills for enhanced living and employment opportunities is derived from subset of those ICT skills which are needed for learning in all curriculum areas [8].
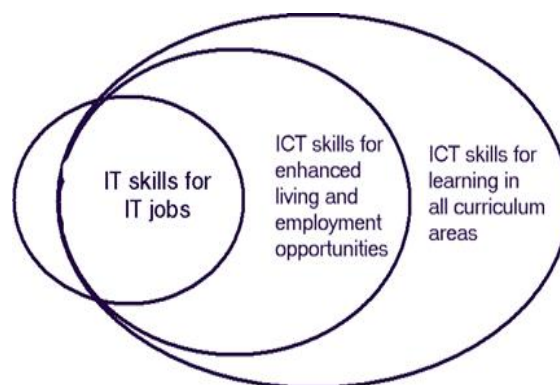

Fig. 3 Relationship between different kinds of ICT use in learning
(Source: http://www.educ.utas.edu.au)

C. Stages of Teaching and Learning

Teaching and learning process is always going together; we can not consider these two as separate and independent activities. In fact, these are similar as two sides of the same coin, interconnected and interrelated. The process of teaching and learning in institutes around the world can be divided into four main stages. These four stages are shown in Fig. 4 [9].
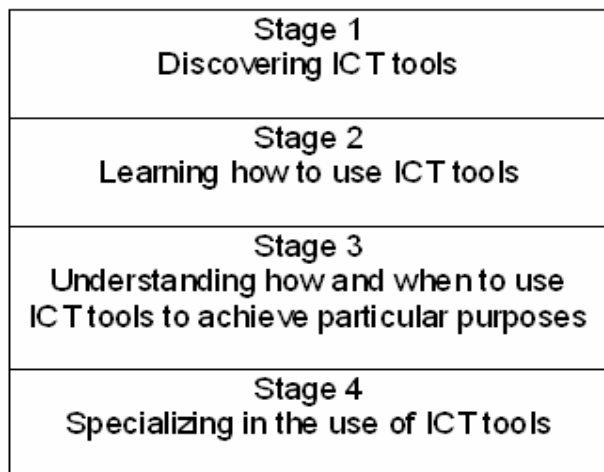
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Fig. 4 Model of stages of teaching and learning using ICT
(Source: fig. from [9])

Stage 1 - Discovering ICT tools:

This stage focuses on discovery of new ICT tools by teachers and students. This is linked with the emerging approach in ICT development.

Stage 2 – Learning how to use ICT tools:

This stage emphasizes on learning the use of new ICT tools. It involves the use of general or particular applications of ICT.

Stage 3 – Understanding how and when to use ICT tools:

It focuses on understanding how and when to use ICT tools to achieve a particular purpose, such as in completing a given project. This stage indicates the ability to recognize situations where ICT will be helpful, choosing the most appropriate tools for a particular task, and using these tools in combination to solve real problems.

Stage 4 – Specializing in the use of ICT tools:

The fourth and last stage involves specializing in the use of ICT tools. This requires deep knowledge about using ICT tools. In this stage students study ICT as a subject to become specialists. Such study concerns vocational or professional education rather than general education.

III. OPPORTUNITIES OF INTEGRATING ICTs IN EDUCATION

Modern universities and institutes have a mission to make teaching learning process effective and interesting. Study of use of ICTs in education, reveals the following opportunities:

A. Improved Teaching Learning Process

The traditional way of teaching learning process can be made more effective and interesting by using information and communication technologies. For example, when a teacher uses audio, video, or power point presentations in his/her lecture, the whole class becomes more attentive about the lecture. Such activities also help students to understand the things easily.

B. Increased Availability of Study Material

In traditional learning system, students and teachers are limited to get knowledge on a particular topic through printed materials only. But use of ICT facilitates them to get variety of study materials on a particular topic using internet from any where and any time.

C. Support for Distance Education and E-Learning

The use of ICT supports distance education and e-learning. Each of the different ICTs - prints, audio/video cassettes, radio and TV broadcasts, computers or the Internet may be used for this purpose. There is a minor difference between distance education and e-learning. The use of ICTs is higher in e-learning than distance learning.

D. Improved Admission and Examination Process

Using ICTs universities and institutes can improve the admission process by putting admission form online and receiving completed form online. They can also generate admit cards for entrance examination online. Even they can conduct entrance and semester/ annual examination online. This will speed up admission and examination process. It also helps in faster result declaration.

E. Help in Research Activities

Application of ICT in education enriches the research activities. Researchers can get information about recent developments in different segments, collect variety of information on a particular topic, and can generate innovative ideas and new findings. Using appropriate software we can easily calculate complex calculations and generate variety of graphs.

IV. CHALLENGES IN INTEGRATING ICTs IN EDUCATION

While considering the opportunities associated with ICT-enhanced education it can be said that ICT-enhanced education is better than a simple education, but there are many challenges, which hamper the exploration and exploitation of its opportunities. In view of integrating ICTs in education have following key challenges:

A. ICT Infrastructure

The main challenge for ICT-enhanced education is the availability of information and communication technologies infrastructure. Before any ICT-based program is launched, policymakers and planners must ensure the availability of the followings: appropriate rooms or buildings to house the technology, computers as well as affordable Internet service for on line learning, and availability of electricity and telephony. In developing countries large areas are still without a reliable supply of electricity and the nearest telephones are miles away.

B. Language and Content

English is the dominant language of the Internet. An estimated 80% of online content is in English [10]. A large proportion of the educational software produced in the world market is in English. For developing countries in the Asia-Pacific where English language proficiency is not high, especially outside metropolitan areas, this represents a serious

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barrier in maximizing the educational benefits of the World Wide Web. Even in countries such as Philippines, Malaysia, Singapore, and India where English is a second language; it is desirable that teaching and learning materials, preferably be developed in the local languages.

C. Teachers with ICT Skills

Lack of teachers equipped with ICT skills is another problem for the use of ICT in education. The institutes where ICT is going to be integrated in education, first of all their teachers must be well trained about ICT tools in education. Before going to teach to students, teachers must know about how and when to use ICT tools to achieve particular purposes.

D. Change Management

Managing the change is one of the biggest problems, as teachers don't want to accept change easily. Change management issues must be addressed as new work practices, new ways of processing and performing tasks are introduced. In general a large number of teachers in educational institutes are non ICT proficient, and resistance to change.

Research has shown that the strategy of adding technology to the already existing activities in institutes and in the classroom, without changing habitual teaching practices, does not produce good results in student learning [11]. The reason for this is due to the fact that the vast majority of teachers are not proficient users of technology, especially computer technology. A number of studies have shown that most teachers consider the two main obstacles to using technology in pedagogical practices to be a lack of resources and training [12].

E. Leadership

Integrating ICT in education is not an easy task, as it requires a wide range of support including higher management, and teachers. Therefore it is necessary to properly convince them for their support, and for this task a leader is required.

Leadership is necessary before, during and after project implementation. Before the project is initiated, leadership is needed in order to explain the model, the concept and create awareness; during the project, leadership is needed to manage change and support the project; and after the project, it is needed to pledge the required adaptability and flexibility of the initiative.

V. CONCLUSION

The present age is the age of technology, whereby technology plays a key role in daily lives; this also includes the education system. There are endless possibilities with the integration of ICT in the education system. The use of ICT in education not only improves classroom teaching learning process, but also provides the facility of e-learning. E-learning has rendered convenience of online learning to thousands of learners who can not avail the benefits of higher education due to several constraints, such as, time, cost, geographical location, age, etc. ICT has enhanced distance learning. The teaching community is able to reach remote areas and learners are able to access qualitative learning environment from anywhere and at anytime. It is important that teachers or trainers should be made to adopt technology in their teaching styles to provide pedagogical and educational gains to the learners.

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Raju Kumar is Assistant Professor in Department of I.T, at Institute of Technology & Science, Ghaziabad, U.P, India. He did MCA from Dr. B.R. Ambedkar University, Agra. He wrote a number of research papers on ICT, and E-Governance, along with book reviews. His area of interest is ICT, database technology, and software engineering (e-mail: rajuk12@gmail.com, rajukumar_12@yahoo.com).