



THE CONCEPT AND APPLICATION OF ICT TO TEACHING/LEARNING PROCESS

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Abstract

Mere learning of ICT skills is not enough, but using ICT to improve the teaching and learning paradigm improves the concept and application of teaching and learning. ICTs are making dynamic changes in the society. They are influencing every aspect of human life. Application of ICT tools in teaching and learning process has changed the total scenario of teaching and learning process. Teaching and learning process of this is not now limited within the classrooms boundaries. ICTs are making major differences in the teaching approaches and ways students are learning. This article discusses the meaning and definition of ICT, various components of ICT for teaching and learning, ICT in education. This article focuses mainly on ICT in teaching/learning process.

Keywords: *Information and communication Technology, ICT tools, computer technologies.*

Introduction

In the past few years, the world has witnessed a phenomenal growth in communication technology, computer network and information technology. Development of new broadband communication services and convergence of telecommunication with computers have created numerous possibilities to use a variety of new technology tools for teaching and learning system. The integration of computers and communications offer unprecedented opportunities to the education systems with its capacity to integrate, enhance and interact with each other over a wide geographic distance in a meaningful way to achieve the learning objectives. The growth of these communication and computer systems, their ease of use, the power and diversity of information transfer allow teachers and students to have access to a world beyond the classroom. It has the potential to transform the nature and process of the teaching and learning environment and envision a new learning culture. Interactivity, flexibility and

convenience have become the order of the day in the ICT supported environment. ICT opens up opportunities for learning because it enables learners to access, extend, transform and share ideas and information in multi-modal communication styles and format. It helps the learner to share learning resources and spaces, promote learner centered and collaborative learning principles and enhance critical thinking, creative thinking and problem solving skills.

Meaning and Definition of ICT

The abbreviation ICT stands for *Information and Communication Technology*. According to (Ajayi, (2008)), It is defined as a diverse set of technological tools and resources used to communicate, create, disseminate, store, and manage information. Then (Voogt & Pelgrum, 2005; Watson, 2006) explained ICT as being divided into two main approaches in education such as; ICT for education and ICT in education. ICT for education implies the development of information and communication technology for learning and teaching purpose while ICT in education involves the adoption of general components of information and communication technology in practical use in teaching and learning processes

Characteristics of Information Technology

Information Technology has the following characteristics:

- *Acquisition, Storage, manipulation, management, transmission or reception of data or information.
- * Real time access to information.
- * Easy availability of updated data
- * Connecting Geographically dispersed regions
- * Wider range of communication media

Information and Communication Technology in Education

Globalization and technological changes have created a new global economy powered by technology, fueled by information and driven by knowledge. The emergence of this new global economy has serious implications for the nature and purpose of educational institutions.

As the access to information continues to grow rapidly, schools cannot be contented with the limited knowledge to be transmitted in a fixed period of time. They have to become compatible to the ever expanding knowledge and also be equipped with the technology to deal with this knowledge.

Information and communication technologies (ICTs) — which include radio and television, as well as newer digital technologies such as computers and the Internet —

have been proven as potentially powerful tools for educational change and reform. When used appropriately, different ICTs can help expand access to education, strengthen the relevance of education to the increasingly digital workplace, and raise educational quality by helping make teaching and learning into an active process connected to real life.

Characteristics of ICT in Education

ICT in education is any hardware and software technology that contribute in the educational information processing. In the context of present era, ICT mainly comprises of Computer technology with its hardware, like, Personal computer machine, infrastructure required for setting up Internet facility and also software like, CD ROM including various programme packages, E-learning strategies etc.

ICT in education is any Information Technology that focuses on the acquisition, storage, manipulation, management, transmission or reception of data required for the educational purpose. For example, the information about students' records, their admissions, updates of their auricular and co-curricular activities. ICT in education is any technology that deals with the exchange of information or in other words communication in the teaching learning process. Uses of Electronic learning technology like, Teleconferencing, power point presentations, CD ROM are Communication Technology which is the part of ICT.

ICT in education is any educational technology that is applied in the educational process. It encompasses Hardware approach like use of machines and materials, Software approach

like use of methodologies and strategies of teaching learning and Systems approach that uses the management technology that deals with the systematic organization of the hardware and the software. Different software packages for the use in different department of education; e.g. library software, administration software, software related to managing the entire teaching learning process. ICT in education is the support material in the hands of the human resource involved in the educational process in order to enhance the quality of education. ICT in education comprises of the application of science of On-line, Offline learning with the help of the computer technology.

Application of Information and Communication Technology in Education

ICT is being utilized in every part of life. Due to the increasing importance of the computer, students -the future citizens cannot afford to keep themselves aloof from this potential medium.

In education, use of ICT has become imperative to improve the efficiency and effectiveness at all levels and in both formal and non-formal settings. Education even at school stage has to provide computer instruction. Profound technical knowledge and positive attitude towards this technology are the essential prerequisites for the successful citizens of the coming decades.

It can be used for the following purposes.

- To broadcast material, online facility or CD-ROM can be used as sources of information in different subjects.
- To facilitate communication for pupils with special needs;
- To use electronic toys to develop spatial awareness and psycho motor control;
- To use the online resource like, email, Chat, discussion forum to support collaborative writing and sharing of information.
- To facilitate video-conferencing or other form of Tele conferencing to involve wide range of students from distant Geographic areas.
- For blended learning by combining conventional classroom learning with E-learning systems
- To process administrative and assessment data.
- To exchange and share ideas -among teachers for the professional growth.
- To carry out internet-based research to enhance, educational process

Advantages of the Use of ICT in Education

ICT encompasses all those gadgets that deal with the processing of information for better and effective communication. In education, communication process takes place between teachers, students, management and administrative personnel which requires plenty of data to be stored for retrieval as and when required, to be disseminated or transmitted in the desired format. The hardware and software like OHP, Television, Radio, Computers and related software are used in the educational process. However ICT today is mostly focused on the use of Computer technology for processing the data. In this context, advantages of ICT in education can be listed down as follows :

- Quick access to information: Information can be accessed in seconds by connecting to the internet and surfing through Web pages.
- Easy availability of updated data: Sitting at home or at any comfortable place the desired information can be accessed easily. This helps the students to learn the updated content. Teachers too can keep themselves abreast of the latest teaching learning strategies and related technologies.

- Connecting Geographically dispersed regions: With the advancement of ICT, education does not remain restricted within four walls of the educational institutions. Students from different parts of the world can learn together by using online, offline resources. This would result in the enriching learning experience. Such collaborative learning can result in developing.

- Divergent thinking ability in students,
- Global perspectives
- Respect for varied nature of human life and acculturation.
- Facilitation of learning

ICT has contributed in shifting the focus on learning than teaching. ICT helps students to explore knowledge to learn the content through self-study. Teacher can help the students by ensuring right direction towards effective learning. Situational learning, Programmed learning, many Online learning courses are some of the example of self-learning strategies that are being utilized with the help of ICT.

- Catering to the Individual differences: ICT can contribute in catering to individual needs of the students as per their capabilities and interest. Crowded class rooms have always been a challenge for the teacher to consider the needs of every student in the class.

- Wider range of communication media: With the advent of ICT, different means of communication are being introduced in the teaching learning process. Offline learning, on line learning, blended learning are some of the resources that can be used in educational institutions. Collaborative learning, individualized learning strategies can enhance the quality of group as well as individual learning. With the real society. This can ensure the applicability of knowledge.

- Wider learning opportunities for pupils

Application of latest ICT in education has provided many to the learners to opt for the course of their choices. Many Online courses are available for them to select any as per their aptitude and interest. Students can evaluate their own progress through different quizzes, ready to use Online tests. This can ensure fulfillment of the employment required in the job market thus minimizing the problem of unemployment. It can also provide more efficient and effective citizens to the society as per the changing needs.

Information and Communication Technology (ICT) in Teaching and Learning Process

In recent times, life has become easier, due to the invention of ICT. In the last few decades, there have been a tremendous growth in the use of ICT in all fields such as education(distant

learning via electronic networks, open learning through students controlled learning pathways, the process of changing teaching and learning styles by using a narrow range of Information Technology based), facilities; industries, businesses, societies, lives of people. Currently, the educational institutions all over the world are integrating ICT with the teaching and learning process in order to provide knowledge and skills to the learners to meet the challenges of educational environment. According to (Adu, & Olatundun, 2013), “It is only through the integration of ICT in education that one can teach students to be participants in the growth process in this era of rapid change”. (Watson, 2001) describes ICT as having revolutionized the way people work today and are now transforming educational systems. Otherwise, if schools train children in yesterday’s skills and technologies they may not be effective and fit in tomorrow’s ICT world. This is a sufficient reason for ICT to be globally recognized. Sometime in the year 2002 Kofi Annan, the former United Nations secretary general pointed out that, in order to attain the goal of Universal Primary Education by the year 2005, that Information and Communication Technology must unlock the door of educational systems, which indicates the growing demand and important place that ICT could receive in education.

During the last three decades, the changes in educational environment have been phenomenal. The model, focus, role of the learner and technology has been changed drastically from traditional instruction to virtual learning environment as depicted below.

Changes in Teaching and Learning Environment

Shifting the emphasis from teaching to learning can create a more interactive and engaging learning environment for teachers and learners. This new environment also involves a change in roles of both teachers and learners. The role of the teachers will change from knowledge transmitter to that of facilitator, knowledge navigator and sometime as co-learner. The new role of teachers demands a new way of thinking and understanding of the new vision of learning process. Learners will have more responsibilities of their own learning as they seek out, find, synthesize, and share their knowledge with others. ICT provides powerful tools to support the shift from teacher centred to learner centred paradigm and new roles of teacher, learner, curricula and new media.

The major shifts have been described in a tabular form below.

Changes in Learners' Roles

From	To
Passive Learner	Active Learner
Reproducer of Knowledge	Producer of Knowledge
Dependent Learner	Autonomous Learner
Solitary Learner	Collaborative Learner

Changes in Curricula & Delivery

From	To
Memorizing Facts	Inquiry Based
Rigid Delivery	Open & Flexible Delivery
Fixed Time & Space	Any Time & Anywhere

The above improvement was as a result of ICT in education which entails the involvement and adoption of general components of information and communication technology

These concepts and application of ICT in learning and teaching demand a new learning environment to effectively harness the power of ICT to improve learning. ICT has the potential to transform the nature of education like where, when, how and the way learning takes place. It will facilitate the emergence of responsible knowledgeable society emphasizing life long learning with meaningful and enjoyable teaching and learning experiences; the move from reproductive model of teaching and learning to an independent, autonomous learning model that promotes initiatives, creativity and critical thinking with independent research. Learners are expected to collect, select, analyze, organize, extend, transform and present knowledge using ICT in authentic and active learning paradigm. Teachers are expected to create a new flexible and open learning environment with interactive, experimental and multimedia based delivery system. ICT helps teachers and learners to communicate and collaborate without boundaries, make learners autonomous and allow teachers to bring the whole world into classroom activities, especially the concept of on-line programmes. It is ultimately important to understand the roles of ICT in promoting educational changes. A basic principle is that the use of ICT changes the distribution and ownership of information resources in the space of teaching and learning and thus changes the relationship among educational participants. While designing any innovative teaching and

learning environment using ICT, the teacher should always keep the learning at the center of all activities, pedagogy should be at the heart; and integration of pedagogy-technology should be the central focus.

Components of ICT for Teaching and Learning

a) Video conferencing: It is a two way communication system. It is also called teleconferencing, it's the use of television video and sound technology (webcam) between people in different locations. It can be used to give and receive lectures irrespective of the location of teachers or learners.

b) World Wide Web: The World Wide Web, known as www, w3 or simply the web, is one of the several internet resources developed to help, publish, organize and provide access to information on the Internet. The web was first developed by Tim Berners Lee I 1989 while working at CERN,

European Particle Physics Laboratory in Switzerland.

c) Web 2.0: The term was coined by Tim O' Reilly at the O' Reilly Media. Web2.0 describes World Wide Web sites that use technology beyond the static pages of earlier web sites. Although web2.0 suggest new version of www, it does not refer to update to any technical specification, but rather to cumulative changes in the way web pages are designed and used. It allows users to interact, collaborate and chat with each other both synchronously and asynchronously. Social Media, Blogs, Wikis, Video sharing are all based on Web2.0 Technology. With web2.0 tools, users can communicate around the world at a nominal cost. It allows population to correspond and spread ideas with each other rather than receiving the information from a single source.

d) Blog and Wikis: Blogs and wikis are fundamentally web2.0 and their global proliferation have enormous implication for libraries and also in teaching and learning process. Blogs may indeed be a greater milestone in the history of publishing than web pages. They enable the rapid production and consumption of web based publications. Blogs contains posts some time similar to journal entries, from a person or a group. The post are dated and listed in reverse chronological order. People can comment on posts as well as provide links to related sites, photos and blogs. Wiki is an online collaborative writing tool. According to (Richardson, 2006) a wiki is a collaborative web space where anyone can add content and anyone can edit content. That has already been published Wikis are designed to help groups collaborate, share and build online content and are especially useful for learners who are separated by time and place.

- e) **Social Media:** Social media are perhaps the most promising and embracing technology. They enable messaging, blogging streaming media and tagging .Some most commonly used social media are MySpace. Facebook, Delicious, Frappr and Flickr networks that have enjoyed massive popularity in web 2.0. It is based on web2.0 technology. MySpace and Face book enable users to communicate with each other, Del.icio.us enables users to share web resources and Flickr enables the sharing of pictures. Frappr is a bit of a blended network, using maps, chat rooms and pictures to connect individual.

Factors Facilitating ICT Learning

1. Pedagogical objectives and goals

The research on educational innovation suggests that it is important for schools to share a reformed vision of teaching and learning in order to create sustainable change at the school and classroom levels. Additionally, in respect to ICT integration, research suggests that successful projects have clear and consistent messages concerning the role of ICT in supporting that vision, and that teachers see how ICT supports their students' learning. Most of the time it is found that although the vision of teaching and learning present in each school resonated with the national (or state) curricula, each school had interpreted the broad vision into a practical understanding that could be implemented in their context. This process of reinterpretation of an abstract vision of teaching and learning with ICT into practical activities appears to be a fundamental step on the process of real classroom reform.

The Indian education system is moving away from a traditional system based on memorization and testing to support a more student-centered approach to teaching and learning with ICT . This change is expressed in the state curricula in terms of curricular frameworks that are often difficult to translate into practice (Rampal, 2002).

2. Leadership

The research literature also indicates that leadership at various levels of the system is important if an innovative project is to take root and grow at the classroom level. Most of these schools function with two levels of leadership—first there is the national or provincial ministry of education that sets overall policy, curricula, and national assessment, and second, there is the building leadership that makes the day-to-day decisions. While issues of national leadership are important for technology projects (Kozma, 2005; Hepp et al., 2004), research shows that leadership within the schools is equally important. Connecting to the discussion in the previous section, the school's leadership is the key nexus in the process of reinterpreting a broad, abstract vision into a practical vision. The findings

from these six schools highlight three aspects of the role of building-level leaders in supporting a process of ICT integration and pedagogical innovation. First, leadership does not come only from the principal.

Second, in all of the schools, the leaders of the ICT initiatives should not just set the vision and provide clear expectations for teachers, they provide support and guidance in teachers' classrooms.

Third, a central role for the school principal—or the person with administrative authority—is to make key decisions about resource allocation. An instructional leader as described above is very important, but there are also specific administrative and logistic challenges around using ICT that school administrators must solve. All of these schools had resource limitations on time, infrastructure, staff, space, and funding, and the administrators had to find solutions to allow change and innovation to take place with the resources that were available. ICT infrastructure is a constant problem for schools in developing countries, and the decisions administrators have to make are often frustrating because they cannot give all students all the access they would like to give them.

3. Professional development and ongoing support

For much the same reasons that supportive leadership is important in helping teachers innovate, ongoing professional development also appears to be a critical factor. In the context of

education reform, the tools and teaching strategies are new to many of the teachers; therefore, both the quality of the professional development courses and the presence of ongoing support for teachers in their classrooms are important. Research suggests that teachers must be offered multiple points of entry into practices supporting ICT use and student centered teaching. This teachers to begin changing their practice from whatever point their context and current practice requires. Research also highlights two features of the teachers' professional learning occurring in these schools: the importance of follow-up, and the informal professional communities that needs to exist in schools. Teachers should design their own unit plans which are important as it helps teachers to bridge the gap between the theoretical discussion of a training course and the practical needs of classrooms. Schools that have established a culture of constant improvement and professional learning tend to be more conducive to ICT for teaching and learning. Daniel Light (2010) in his case study said that Educators at all of the schools under study talked about teachers meeting in groups to plan and discuss new strategies and to share

challenges and successes had contributed to the rich use of ICT for teaching and learning in schools..

4. Experimentation, adaptation, and critical reflection

Research literature's perspective offers an interesting insight on the importance of experimentation for ICT integration and education reform. Findings reveal that the role a culture of experimentation plays in school-wide change and its relationship to leadership, pedagogical goals, and professional development. Educators usually exhibit a willingness to experiment and take on the challenges of trying to do new things. If professional development provides teachers access to information about new tools and practices, there will be a willingness to experiment with novel ideas, and openness to reflect on the successes and failures, in order to create positive changes. In these schools, the culture of experimentation is promoted by the leadership and is in line with each school's pedagogical goals.

5. Time

Much like a physical resource, time is a scarce resource that schools must manage carefully. Time in relation to ICT implementation has to be viewed in two dimensions: (1) teachers' professional development and planning time, and (2) students' time in the classroom or learning activity. Each school should develop their own strategies for training teachers and implementing the use of ICT depending on the particularities of the larger system.

6. ICT infrastructure

In most developing countries, ICT Infrastructure also is commonly a limited resource in schools. With limited resources, it is often difficult for schools to provide sufficient access so students can use ICT during their classes. Research studies suggest that no single strategy will work for all schools with resource limits. Instead, each school developed unique strategies to provide meaningful learning activities using ICT tools, whether it was teachers using ICT-based teaching aids or student ICT use. Although many urban Indian schools have computer labs, there are still too many students to give classes consistent and frequent ICT access during the school day. Thus, the schools in India need to work on strategies to make facilities available to both students and teachers during school hours.

7. Financing and Sustainability

Costs and sustainability are ongoing challenges for all of these schools when attempting to bring in new, complex resources such as ICT. These schools attempt to do two things to manage sustainability of their ICT activities: First, they try to obtain resources from

as many sources as possible, and second, they try to control the costs related to ICT activities. All of the successful schools utilize multiple strategies to obtain funds or ICT resources.

There are three basic sources of funding the schools rely on. First, all three countries have government programs that provide an infrastructure to support these schools. The government programs provide the schools with a basic level of resources, but each of these schools has gone farther. A second critical source is the community: Successful schools have developed good relations with the surrounding community, and the communities value the ICT initiatives of the school. Finally, some schools had their own small sources of revenue: Some of the public schools have concessions, such as a school café or a photocopy shop. These schools also attempted to control other costs associated with ICT, such as ink, paper, and peripherals. For the success of ICT in learning, schools should be encouraged to look at all the tree options of financing and sustainability. The responsibility for change cannot rest solely on the shoulders of the teachers—bringing about these changes is a long-term, incremental process. There is a broad range of factors, from leadership to funding to effective professional development, that help create and sustain the conditions for change. Effective reform requires sustained investment and support along multiple dimensions of the educational system, including physical and technical infrastructure, human resources, curricular frameworks, standards, and assessments. In the end, the success of teachers is dependent on the conditions in which they work.

Conclusion and Recommendation

The integration of ICT into the very idea of teaching and learning has placed pedagogy over technology. Our concern here was not just to master ICT skills, but rather using ICT to improve teaching and learning. The major emphasis of ICT infusion in pedagogy is such that it tends to improve learning, motivate and engage learners, promote collaboration, foster enquiry and exploration, and create a new learner centered learning culture. Since ICT provides greater opportunity for both teachers and students to adjust learning and teaching to individual needs, therefore, it is necessary to enhance the integration of ICT concept and application in School education.

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