

EFFECTIVE USE OF ICT – A CATALYST FOR EDUCATION

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ABSTRACT

For most of the countries in the World, the use of ICT in education and training has become a priority during the last decade. However, very few have achieved progress. Indeed, a small percentage of schools/ colleges/educational institutions in some countries achieved high levels of effective use of ICT to support and change the teaching and learning process in many subject areas. Others are still in the early phase of Information and Communication Technologies adoption. Information and Communication Technology (ICT) has made rapid strides in the past couple of decades. New technologies are now available for information dissemination, enhancement of skills of all sorts, not yet suitably adapted to the needs of the education sector. The immense potential for inducting ICT to come to the aid of Indian education in myriad innovative ways has not been harnessed. Many experiments have taken place in the country, and a large body of knowledge has accumulated in this regard. ICT now provides a new and potentially highly effective vehicle for advancing the quality of education at all levels; this issue needs to be seriously explored and the alternatives expounded. In this connection, the purpose of this paper is to study the use of information and communication technology (ICT) in education and offer recommendations to enhance the use of ICT in education. This paper also discusses various barriers involved in using ICT from students, teachers, administrative and infrastructural perspectives.

Keywords: Use of ICT, Education, Learning, Teaching and Barriers.

INTRODUCTION

In the Indian context, the fundamental role of education in nation-building, progress, security and social and economic development has been recognized from the outset. Even before independence, Gandhiji had formulated a vision of basic education in India, seeking to harmonize intellectual and manual work. Subsequently, the University Education Commission (Radhakrishnan Commission, 1948-49) and the Secondary Education Commission (1952-53), as well as other Commissions and Committees had reviewed the issues relating to educational reconstruction. The Resolution on Scientific Policy (1958) underlined, inter alia, the importance of science, technology and scientific research in education.

The NPE of 1968 aimed to promote national progress, a sense of common citizenship and culture, and to strengthen national integration. It laid stress on the need for a radical reconstruction of the education system, to improve its quality at all stages, and gave special attention to science and technology, the cultivation of moral values and a closer relation between education and the life of the people.

ICT (information and communications technology - or technologies) 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.

ICT enhances learning at anytime and anywhere and can access online course materials, 24 hours a day, seven days a week. Teleconferencing classrooms allow both learner and teacher to interact simultaneously with ease and convenience. Through the use of ICT, multiple resources are abundant on the Internet, and knowledge can be acquired through video clips, audio sounds, and visual presentation and so on and now learning and teaching no longer depend exclusively on printed materials. No doubt, ICT assists in transforming a teaching environment into a learner-centered one (Castro Sánchez and Alemán 2011). Since learners are actively involved in the learning processes in ICT classrooms, they are authorized by the teacher to make decisions, plans, and so forth (Lu, Hou and Huang 2010). ICT therefore provides both learners and instructors with more educational affordances and possibilities

A number of previous studies have shown that an appropriate use of ICT can raise educational quality and connect learning to real-life situations (Lowther, et al. 2008; Weert and Tatnall 2005). As Weert and Tatnall (2005) have pointed out, learning is an ongoing lifelong activity where learners change their expectations by seeking knowledge, which departs from traditional approaches. As time goes by, they will have to expect and be willing to seek out new sources of knowledge. Skills in using ICT will be an indispensable prerequisite for these learners.

Review of Literature

According to Daniels (2002) ICTs have become one of the basic building blocks of modern society within a very short time, Many countries now regard understanding ICT and mastering the basic skills and concepts of ICT as part of the core of education, alongside reading, writing and numeracy. However, there appears to be a misconception that ICTs generally refers to 'computers and computing related activities'. This is fortunately not the case, although computers and their application play a significant role in modern information management, other technologies and/or systems also comprise of the phenomenon that is commonly regarded as ICTs. Pelgrum and Law (2003) state that near the end of the 1980s, the term 'computers' was replaced by 'IT' (information technology) signifying a shift of focus from computing technology to the capacity to store and retrieve information. This was followed by the introduction of the term 'ICT' (information and communication technology) around 1992, when e-mail started to become available to the general public (Pelgrum, W.J., Law, N., 2003). According to a United Nations report (1999) ICTs cover Internet service provision, telecommunications equipment and services, information technology equipment and services, media and broadcasting, libraries and documentation centres, commercial information providers, network-based information services, and other related information and communication activities. According to UNESCO (2002) information and communication technology (ICT) may be regarded as the combination of 'Informatics technology' with other related technology, specifically communication technology. The various kinds of ICT products available and having relevance to education, such as teleconferencing, email, audio conferencing, television lessons, radio broadcasts, interactive radio counselling, interactive voice response system, audiocassettes and CD ROMs etc have been used in education for different purposes (Sharma, 2003; Sanyal, 2001; Bhattacharya and Sharma, 2007).. The field of education has been affected by ICTs, which have undoubtedly affected teaching, learning, and research (Yusuf, 2005). A great deal of research has proven the benefits to the quality of education (Al-Ansari, 2006). ICTs have the potential to innovate, accelerate, enrich, and deepen skills, to motivate and engage students, to help relate school experience to work practices, create economic viability for tomorrow's workers, as well as strengthening teaching and helping schools change (Davis and Tearle, 1999; Lemke and Coughlin, 1998; cited by Yusuf, 2005).

As Jhurree (2005) states, much has been said and reported about the impact of technology, especially computers, in education. Initially computers were used to teach computer programming but the development of the microprocessor in the early 1970s saw the introduction of affordable microcomputers into schools at a rapid rate. Computers and applications of technology became more pervasive in society which led to a concern about the need for computing skills in everyday life. Hepp, Hinostroza, Laval and Rehbein (2004) claim in their paper “Technology in Schools: Education, ICT and the Knowledge Society” that ICTs have been utilized in education ever since their inception, but they have not always been massively present. Although at that time computers have not been fully integrated in the learning of traditional subject matter, the commonly accepted rhetoric that education systems would need to prepare citizens for lifelong learning in an information society boosted interest in ICTs (Pelgrum, W.J., Law, N., 2003).

Need for the Study

Major developments in Communication and Information Technology in recent decades have brought in new dimensions in the fields of transmission of data, and use of IT as a vehicle for monitoring and management, among others. In the education sector, this is one fundamental change since the previous Education Policy of 1986-1992. New possibilities have already opened up for use of information technology in different ways, not only to manage the sector, but also directly assist in enhancing the quality of teaching and learning. Many new applications are already in place; as developments in the IT sector advance rapidly, new opportunities constantly keep emerging, which could be appropriately harnessed and adapted to assist in the field of education. With this back ground study, the researcher seeks to study use of information and communication technology, especially in the field of education. A rapid growth of investments in educational sector has drawn attention to research in this area on the topic titled “**Effective use of ICT – A Catalyst for Education**”.

Objectives of the Study

The main objective of this paper is to study the effective use of ICT in education; in addition to this the following objectives are also formulated.

- To identify barriers to effective use of ICT
- To offer suggestions for better use of ICT in education.

Methodology of the Study

In order to attain the above-mentioned objective, the researcher has collected only secondary data for the research. The researcher has visited many websites, blogs and articles (online and offline) research works etc for the collection of secondary data. Secondary data have been collected from official website of MHRD. Data were also collected from other websites related to use of ICT in education as a whole and published and unpublished reports and periodic journals. Data relating to educational reforms were taken from “National Policy on Education 2016”.

Use of ICT - Some Initiatives in India

- India recognized the importance of ICT in education as early as 1984-85 when Computer Literacy and Studies in Schools (CLASS) was introduced as a pilot project.
- In 1998 National IT Task Force was constituted by the Prime Minister which made several recommendations for making available computers and educational software to teachers and students.

- Government of India also provides assistance to States for production of audio, video and multimedia programmes through State Institute of Education Technology (SIET) set up in 8 States, under the overall guidance and support of Central Institute of Education Technology
- The 'significant role' ICT can play in school education was also highlighted in the national curriculum framework 2005 (NCF). The essential component related to establishment of 'smart schools' designed to become technology demonstrators.
- ICT enabled schools were established in the country under RMSA. The thrust had been essentially on familiarizing the student with the use of computers, and teaching basic operations at secondary levels
- The significant developments like "Digital India Programme" will bridge urban – rural divide with a reliable communication information network, in the next three or four years.
- District Information System for Education (DISE) programme for gathering information and data, can be sharply upgraded for greater reliability and use as a monitoring/management instrument.
- Many high-end schools, particularly in urban areas are already experimenting with video material to supplement the prescribed text books for use in the classroom.
- A number of private companies have emerged to create digital material for use in the classroom, as well as for individual learning.
- The Government of India's initiative in creating IGNOU is an important landmark in Distance learning has made significant progress;
- The Government of India introduced the District Information System for Education (DISE) in 1994, to be implemented by NUEPA. As conceived at that time this was designed to capture information from every school, routing it through the block level, and aggregating it at the district level for final compilation at the state headquarters.
- In the next two to three years all blocks will be covered through fibre-glass broadband network, as per the plans of the Ministry of Telecom; the connectivity will also be extended within a short period to 2.5 lakh Gram Panchayats, with a local Wi-Fi hotspot for exchange of data.

Use of ICT for Improving Quality of Education

- New dimensions in the fields of transmission of data, and use of information technology are a vehicle for monitoring and management of education.
- Use of information technology can directly assist in enhancing the quality of teaching and learning.
- ICT also sharply improve the quality and speed of delivery of information and many other services to the education field, and could dramatically improve two-way exchange of data between the field formations and the management located at district/state/central headquarters.
- The potential for using imaginatively information technology for preparation as well as in-service training of teachers, as also to support class-teachers to put together creative teaching material to enhance the learning process needs to be explored, developed and exploited.
- use of computer is not required by the student, nor even by the teacher; only a video projection or equivalent of text-book material, suitably prepared and adapted, with animation features to make it attractive for young children, is used as a teaching-aid by the teacher in the classroom.

- Increased enrolment in schools and increase in attendance percentage; (b) Average attendance increase from 30% to 80% in Government schools and 90% in Private Schools; (c) Increased education standards in grade 1 and 2 – Students now able to write in grade 1, not normally demonstrated by students even in grade 3; (d) increased level of confidence in students; (e) motivated teachers/students; and (f) sharply increased scores in assessments.
- High quality teaching material, once prepared, can be reproduced at nearly no cost.
- Remedial education to help slow learners to come up to the average class level has been dealt with augmentation modules, through animation and videos.
- adults will not spare the time to learn new things, unless they have special interests in acquiring new skills, or are motivated to learn new languages or other material. Thus many illiterate women groups have been motivated to learn banking techniques through such IT video modules.
- In many western systems, even from senior school classes onwards, the basic lecture by the teacher is sent on the internet to be seen at home by the student, to be followed up in the classroom by a discussion, question-answer session and analysis – to sharply enhance the learning experience.
- The examination system will have to be revamped to test knowledge and understanding and not reproduce the text books. ICT can no longer be treated as a school subject; it has to become a way of learning process.

Some More Uses of ICT in Education from the Literature

The advantages of ICT in education have been extolled in the literature. The use of ICT has been found to:

Effective and Efficient use of Digital Information by the Students: According to Brush, Glazewski and Hew (2008), ICT is used as a tool for students to discover learning topics, solve problems, and provide solutions to the problems in the learning process. ICT makes knowledge acquisition more accessible, and concepts in learning areas are understood while engaging students in the application of ICT.

Promote Student-Centric and Self-Directed Learning: According to Castro Sánchez and Alemán (2011), students are able to build new knowledge through accessing, selecting, organizing, and interpreting information and data. Based on learning through ICT, students are more capable of using information and data from various sources, and critically assessing the quality of the learning materials.

Enhanced Creative Learning: Chai, Koh and Tsai (2010) argues that ICT provides more creative solutions to different types of learning inquiries. Learners can access all types of texts (e-Books) from beginning to advanced levels with ease through computers, laptops, personal digital assistants (PDAs), or iPads. More specifically, these e-books may come with some reading applications, which offer a reading-aloud interface, relevant vocabulary-building activities, games related to reading skills and vocabulary acquisition, and more. Therefore, ICT provides innovative ways to meet a variety of learning needs.

Encourage Collaborative Learning across the World: Koc (2005) mentioned that using ICT enables students to communicate, share, and work collaboratively anywhere, any time. For instance, a teleconferencing classroom could invite students around the world together simultaneously for a topic discussion. They may have the opportunity to analyze problems and explore ideas as well as to develop concepts. They may further evaluate ICT learning solutions. Students not only acquire knowledge together, but also share diverse learning experiences from one another in order to express themselves and reflect on their learning.

Develops Critical (Higher-Order) Thinking Skills and Promotes Constructive Learning Approach: Levin and Wadmany (2006). McMahon's study (2009) showed that there were statistically significant correlations between studying with ICT and the acquisition of critical thinking skills. A longer exposure in the ICT environment can foster students' higher critical thinking skills. Thus, schools are strongly advised to integrate technology across all of the learning areas and among all learning levels. Where this is done, students are able to apply technology to the attainment of higher levels of cognition within specific learning contexts.

Improve the Quality of Teaching and Learning: Lowther et al. (2008) analysed that there are three important characteristics are needed to develop good quality teaching and learning with ICT: autonomy, capability, and creativity. Autonomy means that students take control of their learning through their use of ICT. In this way, they become more capable of working by themselves and with others. Teachers can also authorize students to complete certain tasks with peers or in groups. Through collaborative learning with ICT, the students have more opportunity to build the new knowledge onto their background knowledge, and become more confident to take risks and learn from their mistakes. Further, Serhan (2009) concluded that ICT fosters autonomy by allowing educators to create their own material, thus providing more control over course content than is possible in a traditional classroom setting. With regard to capability, once students are more confident in learning processes, they can develop the capability to apply and transfer knowledge while using new technology effectively and efficiently. By using ICT, students' creativity can be optimized. They may discover new multimedia tools and create materials in the styles readily available to them through games (Gee 2007, 2011), CDs, and television. With a combination of students' autonomy, capability, and creativity, the use of ICT can improve both teaching and learning quality.

Facilitate Access to Course Content for Teaching: Watts-Taffe et al. (2003) found that teachers can act as catalysts for the integration of technology through ICT. If the encouragement, equipment, and necessary technological support are available from institutes for the teachers, developing an ICT class will be easier for them. The main responsibilities of these teachers will be changing their course format, creating and explaining the new assignments, and arranging for the computer lab through their technology learning specialists or assistants. In sum, as Reid (2002) has indicated, ICT offers students more time to explore beyond the mechanics of course content allowing them to better understand concepts. The use of ICT also changes the teaching and learning relationship. Based on the findings of Reid's study, teachers reported that the relationship between teacher and learner is sometimes reversed with regards to information technology. This relationship boosts students' confidence when they are able to help teachers with technical issues in the classroom. Therefore, ICT changes the traditional teacher centered approach, and requires teachers to be more creative in customizing and adapting their own material.

Barriers to Effective Use of ICT

The existing literature has also identified some barriers and these barriers are classified into four categories based on the perspectives of students, teachers, administrators, and ICT infrastructure. Some suitable solutions for addressing these barriers are also discussed.

Barriers and Solutions: Student Perspective: Frederick, Schweizer and Lowe (2006) showed that student mobility, special needs, and anxiety over standardized test results are the main challenges associated with ICT use. These challenges can be solved by providing more authentic group- and problem-based learning activities, and adequate learning support (Whelan 2008).

Whelan (2008) also identified some more barriers like subpar technical skills that reduce access to ICT in classroom; an insufficient number of academic advisors and lack of timely feedback from instructors; and reduced interaction with peers and instructors. Therefore, the author recommends the following strategies to facilitate the learning process: more induction, orientation, and training for students; an increased emphasis on the importance of instructor access and effective administration; and the expansion of podcasting and online conferencing tools. In addition, Castro Sánchez and Alemán (2011) encourage students to acquire specific technical skills to facilitate learning in ICT environments.

Barriers and Solutions: Teacher Perspective:

- Low teacher expectations and a lack of clear goals for ICT use in schools (Al-Bataineh et al. 2008);
- A lack of teacher collaboration and pedagogical support, as well as a lack of experience among cooperating teachers (Ertmer and Otterbreit-Leftwich 2010);
- Insufficient time to master new software or integrate ICT during a class period (Almekhlafi and Almeqdadi 2010);
- Insufficient skills for managing teaching materials (Frederick, Schweizer and Lowe 2006);
- Low software competence and habitual ways of conceptualizing what and how students should learn (Goktas, Yildirim and Yildirim 2009);
- Limited knowledge and experience of ICT in teaching contexts (Honan 2008);
- A lack of specific knowledge about technology and how to combine it with the existing pedagogical content knowledge to support student learning (Hutchison and Reinking 2011);
- Excessive focus on teaching technical or operational skills rather than course content (Lim 2007);
- Pressure to improve scores on national examinations (Liu and Szabo 2009);
- A lack of recognition and encouragement of the timely and effective use of ICT (Tezci 2011a);
- A lack of in-service training on the use of ICT (Yildirim 2007);
- Technical problems in the classroom (Yildirim 2007);
- Classroom management with large class sizes (Tezci 2011a);
- A lack of motivation, and technical and financial support (Liu and Szabo 2009);
- Uncertainty about the possible benefits of using ICT in the classroom (Yildirim 2007); and
- Lack of specific and definite skills to integrate technology and instruction to improve student learning (Al-Bataineh et al. 2008).
- Several strategies for dealing with these challenges have been suggested. Schools are encouraged to:
 - Provide professional development activities related to technology to update teachers' skills and knowledge, and offer technical support when needed (Al-Bataineh et al. 2008);
 - Support partnerships that help teachers share effective technology practices and experiences (Ertmer and Otterbreit-Leftwich 2010);
 - Provide workshops that allow teachers to reflect upon effective strategies for technology integration into instruction and unveil issues that are central to understanding the process of technology integration into instruction (Almekhlafi and Almeqdadi 2010);
 - Offer opportunities to virtually observe teachers who use technology (Frederick, Schweizer and Lowe 2006);

- Augment curricula with technology-enhanced materials (Goktas, Yildirim and Yildirim 2009);
- Provide enough freedom for teachers in selecting and covering curriculum materials (Honan 2008);
- Provide effective, timely, and continuous training to improve ICT skills and manage a technology-rich classroom (Hutchison and Reinking 2011);
- Encourage positive attitudes about the significance of integrating ICT into instruction (Lim, 2007); and
- Provide adequate technical support (Liu and Szabo 2009; Tezci 2011a; Yildirim 2007).

According to Tezci (2011a), teachers should learn not only how to use technology to enhance traditional teaching or increase productivity, but also should learn from a student centered perspective how ICT can be integrated into classroom activities in order to promote student learning. This means that teachers need to use ICT in more creative and productive ways in order to create more engaging and rewarding activities and more effective lessons (Birch and Irvine 2009; Honan 2008). Hence, Castro Sánchez and Alemán (2011) suggested that teachers keep an open mind about ICT integration in classroom. It is imperative that teachers learn new teaching strategies to adapt to the new instruments when teaching with technology. However, Yildirim (2007) found that teachers use ICT more frequently for the preparation of handouts and tests than to promote critical thinking. Similarly, Palak and Walls (2009) found that teachers mainly use technology to support their existing teaching approaches and rarely to foster student-centered learning. According to the authors, one possible explanation is a lack of models for how to use technology to facilitate learning, and limitations related to contextual factors such as class size and student ability. Further, Brush, Glazewski and Hew (2008) found that pre-service teacher preparation does not provide sufficient ICT knowledge to support technology based instruction, nor does it successfully demonstrate appropriate methods for integrating technology within a curriculum. More training should be provided in pre-service teachers' curricula, and ICT skills must be applied in the classroom in order to integrate effective technology strategies (Supon and Ruffini 2009). To help teachers cope with these difficulties, Chen (2008) suggested that rather than only providing education theories, ICT researchers should also document examples of how teachers accomplish meaningful and effective technology integration to meet their pedagogical goals and needs.

Barriers and Solutions: Administrative and ICT Infrastructure Perspective: In addition to the challenges faced by both students and teachers in the use of ICT, other obstacles also exist in terms of an administrative and ICT infrastructures. Such barriers include:

- School inspectors focus more on the quantity of course content and student test scores than on ICT usage (Yildirim 2007);
- A lack of appropriate administrative support for the effective use of ICT (Lim 2007);
- Administrative mandates to improve examination results, which shifts the focus away from using ICT to engage students in higher-order thinking activities (Goktas, Yildirim and Yildirim 2009);
- A lack of appropriate course content and instructional programs (Yildirim 2007); and
- A lack of appropriate hardware, software, and materials (Yildirim 2007).

To address these barriers, Yildirim (2007) suggested that schools need to provide appropriate access to technology. Furthermore, schools and related institutional systems need to employ new policies to involve teachers in the decision-making and planning processes regarding ICT in their classrooms. Lim (2007) conducted a qualitative study examining effective and ineffective ICT integration in schools in order to provide tangible solutions. The results showed that the availability of ICT tools, the establishment of disciplinary and educational principles and procedures, as well as the division of labor among teachers, teaching assistants and students are crucial elements to establishing a well-managed ICT-integrated class. By emphasizing these elements, a learning process that is more likely to engage students in higher-order thinking can be facilitated. Ertmer and Otterbreit-Leftwich (2010) reviewed the existing literature on the necessary elements to enable pre-service and in-service teachers to apply ICT as a meaningful pedagogical tool. They recommended that schools provide teachers with solid evidence supporting the positive impact of technology-based and student-centered instruction on student learning and achievement on standardized tests. For instance, schools can provide opportunities for preservice teachers to observe a variety of examples and models, which they can then apply with real learners. Schools need to help pre-service teachers understand difficulties they may face when they begin to use ICT in their classrooms, and present effective strategies for addressing them. In sum, school leaders should ensure that teachers understand that the ultimate objective of technology integration is to advance the teaching and learning process, not replace it. Developing a pedagogical model requires a strong link between theory and application in order to help teachers overcome the obstacles faced in technology integration (Keengwe and Onchwari 2009). Thus, Staples, Pugach and Himes (2005) stated that good planning for technology integration requires a special understanding of specific hardware and software related to the curriculum. Staff development and teacher training are also indispensable to supporting the curriculum with technology integration.

Scope for Future Research

- Future researchers are recommended to undertake studies related to the benefits and challenges of a combination of ICT and other student-centered approaches such as collaborative learning across all learning areas.
- Only few previous studies have examined the challenges or barriers to ICT integration from students, teachers, and administrative perspectives with involvement of specific teaching strategies and activities. This is also an area worth further investigation in future research.
- This paper is completely based on secondary data, future research is recommended to study impact of ICT in education by using primary data.

Conclusions

The adoption and use of ICTs in education have a positive impact on teaching, learning, and research. ICT can affect the delivery of education and enable wider access to the same. In addition, it will increase flexibility so that learners can access the education regardless of time and geographical barriers. It can influence the way students are taught and how they learn. It would provide the rich environment and motivation for teaching learning process which seems to have a profound impact on the process of learning in education by offering new possibilities for learners and teachers. These possibilities can have an impact on student performance and achievement. Similarly wider availability of best practices and best course material in education, which can be shared by means of ICT, can foster better teaching and improved academic achievement of students.

Hence, it is concluded that ICT now provides a new and potentially highly effective vehicle for advancing the quality of education at all levels; The overall literature suggests that successful ICT integration in education

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