Impact of ICT on Education and its Challenges

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ABSTRACT

The remarkable growth and evolution in information and communication technology (ICT) in the past few decades has transformed modern society in almost every aspect of life. The impact and application of ICT have been observed in almost all walks of life including science, arts, business, health, management, engineering, sports, and education. ICT in education is being used extensively for student learning, creativity, interaction, and knowledge sharing and as a valuable source of teaching instrument. Apart from the student's perspective, it plays a vital role for teacher education, instructional methods and curriculum development. There is a significant difference in growth of ICT enabled education in developing countries compared to developed nations and according to research, this gap is widening. ICT gradually infiltrate in almost every aspect of life. It has a deep and profound impact on our social, economic, health, environment, development, and work, learning, and education environments. ICT provides very effective and dominant tools for information and knowledge processing. It is firmly believed that the coming generation should be proficient and confident in the use of ICT to cope with the existing international standards. This is only possible if schools can provide basic ICT infrastructure to students and to develop an ICT-integrated curriculum which covers all aspects of learning and creativity in students.

Keywords: ICT, education, ICT infrastructure, teacher education etc.

INTRODUCTION

The use of technology in education has an ironic history and is being used for the last 200 years starting in 1822 with Charles Babbage, who invented the first computing machine, followed by the invention of the typewriter by Christopher L. Sholes in 1873, the mimeograph by Albert Blake Dick in 1887 and the radio by Guglielmo Marconi in 1894. There were also significant inventions after World War II, which include the photocopy machine invented by Chester Carlson in 1949, the overhead projector by Roger Appledorn in 1950 and the practical videotape recorder by Charles Ginsburg in 1951. The revolution in technology starts with the invention of personnel computers (PC's) by IBM around 1980 followed by the Internet by ARPANET in the late 80's. Since then, computers and the Internet are being extensively used in academic institutions for learning, knowledge sharing and integration. The invention of interactive white boards (smart boards) by PARC in 1990 has introduced a new innovation into the classroom by integrating the white board with multimedia projectors, computers and the Internet. The use of smart boards have been increasing in academic institutions and created a positive impact. The technology moves on further since the introduction of Facebook by Mark Zuckerberg in 2004. The use of social networks in education is enormous and is considered to be a very good tool for collaborative learning and information sharing. There are many other social networking applications like LinkedIn, YouTube and WhatsApp followed by Facebook and are used in educational environments.

Lastly, the invention of the iPad in 2010 by Steve Jobs, enables to connect with thousands of mobile applications that enhance the learning and creativity in students and endows teachers to offer better learning opportunities. It is very important however, to learn, what is the basic ICT infrastructure required in an academic environment based on international standards? The basic infrastructure includes the provision of computers (desktops), local area network, Internet connectivity, fast bandwidth and related equipment. Students and teachers must have access to basic software for desktop publishing, word processing, spreadsheet, graphics, database and presentations. Students can have access to various websites and can communicate with their peers and teachers through email and other verbal and nonverbal applications. Trained and skilled human resources are required for ICT implementation in an academic institution through which the curriculum can be revised to integrate technology in different grades according to international standards such as the K-12 curriculum.

Information and communications technology (ICT) is an extensional term for information technology (IT) that stresses the role of unified communications and the integration of telecommunications (telephone lines and wireless signals) and computers, as well as necessary enterprise software, middleware, storage and audiovisual, that enable users to access, store, transmit, and manipulate information.

The term ICT is also used to refer to the convergence of audiovisual and telephone networks with computer networks through a single cabling or link system. There are large economic incentives to merge the telephone network with the computer network system using a single unified system of cabling, signal distribution, and management. ICT is an umbrella term that includes any communication device, encompassing radio, television, cell phones, computer and network hardware, satellite systems and so on, as well as the various services and appliances with them such as video conferencing and distance learning. ICT is a broad subject and the concepts are evolving. It covers any product that will store, retrieve, manipulate, transmit, or receive information electronically in a digital form (e.g., personal computers, digital television, email, or robots). Theoretical differences between interpersonal-communication technologies and mass-communication technologies have been identified by the philosopher Piyush Mathur.

Skills Framework for the Information Age is one of many models for describing and managing competencies for ICT professionals for the 21st century. ICTs offer the potential to share information across traditional barriers, to give a voice to traditionally unheard peoples, to provide valuable information that enhances economic, health and educational activities. The role of ICT cannot be undermined keeping in view its pertinent uses. ICT is useful in education; for digital literacy and developing all kinds of resources; in infrastructure development; in logistics management; in healthcare; for livelihood generation and empowerment of masses; for e-governance; in administration and finance; specialized business and industrial uses; agricultural uses; in research and development and for economic growth and poverty alleviation. ICT has a direct role to play in the education sector. It can bring many benefits to schools, educational institutions as well as to the community.

ICT is the convergence of computer, communication and content technologies. It has attracted the attention of academia, business, government and communities to use it for innovative profitable propositions. In order to compete in a global competitive environment, a highly skilled and educated workforce with aptitude and skill sets in application of ICT is inevitable for every nation. ICTs are a potentially powerful tool for extending educational opportunities, both formal and non formal, to previously underserved scattered and rural populations, groups traditionally excluded from education due to cultural or social reasons such as ethnic minorities, girls and women, persons with disabilities, children with special needs and the elderly, as well as all others who for reasons of cost or because of time constraints are unable to enroll on campus. Use of ICT will catalyse the cause and achieve the goals of inclusive education in schools. There is no conclusive research to prove that student achievement is superior when using ICTs in the education space, either in the developed or in developing countries. However, there is a general consensus among practitioners and academicians that integration of ICTs in education has an overall positive impact on the learning environment.

ICT IN TEACHING AND LEARNING

ICT provides adaptable and powerful tools that can greatly enhance the learning skills of teachers as well as students. These tools must be available in every resource room classroom, laboratory, teacher's offices and libraries. We may categorize ICT tools in two categories according to their use in school education at different levels in terms of complexity: The basic and generic tools refer to the tools which can be taught at all levels of school education without any distinction. However, the complex levels of the tools may be taught at the higher levels with respect to the curriculum. Following are the ICT-based activities for teachers to improve instruction method (communication), learning, and testing and evaluation process.

Teaching

a)   Use of presentation and word processing software for better delivery of lesson plans and interactive learning.
b)   Improve the speech abilities and pronunciation of students using specific software and hardware such as microphones, headphones and speakers.
c)   Video conferencing systems can be used occasionally in higher classes to allow guest speakers from distant places or involve students from other schools in shared dialog.
d)   Smart boards can be used for better interactive lecture delivery. Course content and lesson plans can be made available on school website. Students must have access to the Internet in schools and libraries to access the website.

e)   Encourage students to explore and access information using websites to complete assignment tasks.
f)   Learning and educational software could be used to enhance student skills in a specified area.

Learning

a)   Searching and collecting information in the form of facts, lecture notes, lecture slides, pictures and videos from various web sites using internet for submission of class assignments and projects.
b)   Create folders and save data in files for further use and create animations to understand real world concepts Digital books, digital on-line libraries, educational sites and encyclopaedia provide quick access to information.
c)   Creating and managing multimedia content (audio, videos, animations, and images) and integrating them in class presentations as PowerPoint slides
d)   Simulated learning provides a virtual learning system (feel of real situation).
e)   Publication of pamphlet/brochures for awareness with the institution and among community members.

Testing and Evaluation Process

a)   Managing academic records of the students.
b)   Creating pool of questions for students.
c)   Generate online tests from the question bank.
d)   Data analysis and creating summarized reports and charts.

BENEFITS OF ICT

ICT can provide a considerable benefit in supporting learning. By using technology in their learning, the students can be active learners. They will be aware of what information they need, why they need it, and how they can get that information. As mentioned by Bransford, Brown, and Cocking an active learning allows the students to decide when they require particular information and whether they have already understood that information or not. This active learning also implies an independent learning. By having access to internet in their school the students will not totally depend on the teachers. They can explore information available in the internet, find information that they need, copy it, and go on to find more and more information. By using this learning system, the students also becomes self-managed in their learning process. As noted by Jarold and Sue self-managed learning allows the students to be self-motivated and self-directed learners who will be able to readily, efficiently, and quickly respond to the quick change of information. The use of blog, for instance, can allow the educators and students to be very up-to-date to the issues and discussion in educational sector or other sectors. Thus, we do not have to wait the newest revision of printed educational books or journal to know what happens in our educational sector for longer time. ICT also can provide a way for dynamic and collaborative learning. By using internet our learning is not limited to the school hours, demographically where we are, and who our teachers are. We can access internet anytime and anywhere.

As stated by Uhomoibhi e-learning allows the students to get information faster from everywhere and anytime. Technology also enables us to cross the demography limits. Rural students can access information from urban areas, get information and share knowledge with other students or teachers in the same area or even different countries. Besides dynamic learning, ICT allows all the human components of schools; the   principals,   administrators,   teachers,   IT coordinators, and the   students to get involved in the collaborative learning and forming learning communities. As mentioned by Moodiel by working together we can do what we cannot do individually. The most important learning aspect in collaborative learning that we want to achieve using ICT is interactivity and communication. As   mentioned   by Rodrigues "effective   learning   happens   when   students   are interactively   engaged   in   a   learning   task." Learning using ICT is more than learning through memorization. It allows the learners to experience their learning processes, being interactive, enjoy and have fun with technology. As stated by Rodrigues) by using technology to support collaborative learning, there will be not only human-machine interaction but also human-human interaction. Web-based-learning context, for instance, allows the students to interact with teachers or other students mediated by machine.

CHALLENGES IN ICT

Digital Divide

The digital divide is the gap between individuals and organizations having technology and Internet access compared to those who do not have technology access and Internet facilities. Unfortunately this gap is widening and the countries of the third world in Asia, Africa and other continents have a large number of

the population that do not have access to technology due to poverty. It is a great challenge for governments and the respective communities to provide access to technology and the Internet for such deprived students.

Content Development

Content development is one of the important elements of ICT-based education. The focus should be given to the integration of ICT in content and the curriculum at different cognitive levels and disciplines. There are examples of the successful integration of ICT in content such as the K-12 curriculum, but it is unfortunate that most of the content which is being taught in schools has no connection with ICT tools.

Capacity Building

There is a significant deficiency in the capacity of teachers and staff to cope with the ICT infrastructure. Mostly, teachers are not well trained and have no certification. The support and maintenance staff is also deficient in many school settings. In underdeveloped countries this problem is on a larger scale and mostly the skilled personnel are concentrated in big cities. Government and private organizations must initiate short training programs for teachers and staff to increase their capacity.

Security and Privacy

Security and privacy is one of the very important concerns in any ICT-based environment. The students usually are unaware of the fact that their personal data may be seen or accessed by unauthorized persons and that this information must not be seen by others. There are two important strategies to solve this problem, one is to create awareness among teachers, students and staff, and other is to integrate security and privacy related applications to the system for prevention.

High Cost

Although the cost of technology has come down considerably over the last two decades, for under-developed countries, the cost of hardware equipment including personal computers, accessories, smart boards and the establishment of a network is still on the higher side. There is a high cost of providing internet broadband connectivity to all students and staff in an educational setup. Government, NGO's and vendors should come forward to support schools and other academic institutions for building ICT infrastructure.

Unsteady and Inadequate Electrical Power Supply

The irregular supply of electrical power has crippled the Nigerian economy and hindered the progress of research carried out by institutes, groups and individuals in the country. It is maddening for any establishment to start off new projects without addressing the almighty power supply problem. It is even worse to embark on extensive ICT project within an educational institution, without solving power problems first. The Federal government is however, working towards improving the generation of enough megawatts of power in the country. The average power supply in the year 2008 was about 4hrs/day. Alternate sources of power are standby generators, batteries and solar panels. The premier universities cannot foot the bill of maintaining several standby generators that gulp down 10-30 litres of diesel per hour at 0.85USD per litre; nor can they purchase enough solar panels to go round the campus. Not all local ISPs can maintain their boosters for 24hrs due to high cost of gas; and many subscribers cannot use the Internet effectively as there is hardly electrical power to do as wished. Sometimes, low voltages that do more harm than good is supplied. When power is rarely supplied, the admirable goals of transforming education with ICT and taking a paradigm shift in education is all a dream; having access to educational resources on demand, anytime, anyhow and anywhere is a story; e-learning would not be sustained either. Also, Mr. Egwu identified infrastructure availability as the bane of e-learning in Nigeria, especially with the erratic power supply situation, compounded by lack of access to technology. "That is why this committee is going to do basic work on infrastructure. It is not just enough to say we want bandwidth, broadband or the connectivity in isolation, for the foundation to be strong, power must be involved.

ICT Infrastructure and Lack of Access

The underlying assumption for ICT in education is universal access to the network. Although some progress has been made in this front, there is urgent need to break the crippling access barrier confronting institutions of higher learning in Nigeria. The profile is vastly different from campus to campus. Some have Campus Area Networks (CAN) backed by wireless narrowband or fibre-optic backbone; some have only Internet cafes with grossly insufficient computers for the user base with a 50:1 ratio being typical and

others have departmental LANs. The expected quality and performance will correspondingly be low. Web based education in the form of online, mobile and distance education requires reliable computer networks, broadband connectivity, fibre-optic backbones for all the bandwidth hungry applications and to interconnect offices, departments and centres to the public Internet via the campus area network. High student enrolment, inadequate funding of universities and lack of technology budget exacerbate the problems of ICT infrastructure.

Future of ICT in Education

The use of ICT in education has increasingly become an essential element of the educational environment. Accompanied by technological tools, use of ICT in education is to become an increasingly ever-present reality in society, hence expansion to embrace students, teachers and educational institutions will result in optimization of the teaching-learning process. Undoubtedly, an analysis of different views in the education sector shows the importance and growing perspective of technology, which would advance social and collaborative learning, with a dimension capable of fostering the liaison between current societies and an education that is both transformative and adaptable.

RECOMMENDATION

The following key points may be considered as recommendations for the development of ICT driven education in India:

a) Adequate funding is necessary for tertiary education in general and development of ICT in particular. To this end, government should increase funding for the entire educational sector.

b) In addition to improved funding by the government and revenue generation drives by individual institutions, government needs to implement policies which will draw the private sector into ICT development. Government should work with the private sector and civil society to ensure affordable and sustainable access to ICT infrastructure.

c) There should be frequent workshops and training programs to train the teaching and non-teaching staff of higher learning institutions in order to make them competent to handle and operate the ICT infrastructure and services.

d) There should be clear cut instructions from the concerned authority regarding the validity and recognition of online degree courses being offered by institutions across India.

CONCLUSION

Implementing ICT in schools/education has many benefits and difficulties. Each school has its own barriers depending on its contextual factors. Generally the difficulties can be classified into four kinds of barriers. Those are technological barriers, teachers' refusal, students' refusal, and poor schools' technological system. To successfully implement ICT in schools need to consider many aspects. It will waste a lot of time, energy, and money if before implementing it, we do not consider those aspects. Those are the schools' culture, leaders, ethics, and technological management system.

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