INFORMATION AND COMMUNICATION TECHNOLOGY IN EDUCATION: ISSUES, BARRIERS AND STRENGTHS OF SYNCHRONOUS ICT MEDIA

C.A. Oduma
Business Education Department, Ebonyi State University, Abakaliki
and
Chinagolum Ituma
Computer Science Department, Ebonyi State University, Abakaliki

Abstract

Information communication technologies application in education is one of the most concerns of education authorities around the world. The whole intent of ICT use in education is to improve the system to benefit the recipients by ensuring that the recipients acquire more salable work skills. Such work skills that could enable them become more functional and useful to themselves and the society in general. With this in focus, this paper reviewed the basic ways in which the application of ICT on education could be made possible. In doing this, the paper centred only on synchronous ICT media in education. That is, ICT media requiring all participant in a teaching and learning process to all be present at the same time even though in different locations. The paper further discussed the effectiveness of ICT in education as well as the general impact of ICT media in education. To further extend the knowledge of the audience, this piece, also captured the advantages of ICT application, ICT generated changes in the education system as well as some pertinent issues for consideration on ICT use in education. The paper concludes that ICT use in education is challenging, and that the world over, countries pursue ICT use in the education as a priority agenda in the education system. Finally, the paper stresses that ICT use in education may be enabled by many factors amongst which are: the availability of a well designed website and an equipped class with functional computers, video projectors as well as the availability of experienced resource instructors.

Keywords: Information and communication technology, education, media

Introduction

ICT application in education is one of the most concerns of educational authorities around the world. In Nigeria today there has been promising effort of government in partnership with ICT inclined private sectors in the training of both students and teachers in the use of ICT gadgets. In fact, all tertiary institutions in the country are struggling to be ICT compliant, i.e. to adopt the system for classroom instruction, students learning and for administrative convenience (Sayed, 2001). There are three basic ways in which the application of ICT in education could be described and understood (Sayed, 2001). These include:

ICT Education: This is the most common understanding of the field of ICT in education. Essentially, it refers to the creation of human resources to meet the information technology needs of the knowledge economy (Torkman and Baloh, 2008). Nigeria as a developing nation is trying to create educated and efficient manpower (not just computer operators) to address complex job opportunities in computer hardware and software, as well as in computer engineering (Sayed, 2001).

Nigeria ICT in education policy should therefore describe the steps by which computers will be placed in schools, how teachers and students will be provided with the basic computer programming skills to cater for the growing job market in computer base technologies.

ICT supported education: Distance education universities like National Open University of Nigeria (NOUN) use ICT to support the print content that they deliver to students. These may include broadcast audio and video such as radio and television programmes, audio and video tapes delivered to students as part of a learning kit, and in more recent times multimedia content such as lessons which are delivered off line ie. on CDs (Kisilowska, 2002). This is also sometimes called multimedia education, where multiple media are used to support learning.

ICT enabled education is any educational programme that is purely delivered through ICTs or with ICT delivered content as the primary backbone of the teaching – learning process, such as online courses through the web is ICT enabled education.
In simple words, this form of education requires ICT access and also requires that the learners use ICTs as a primary or basic medium of instruction (Fathi, and Azadmanesh, 2007).

When deciding to use ICT, effort should be made to determine the purpose for which you will make your choice of the ICT; as well as the objective you expect to achieve with the gadget. For instance, you should endeavour to put across the following questions. Is it to teach computer skills, to support the learning process, or to instruct through the ICT itself? One basic challenge for the learners is that in our education system, learners are often classified into four groups. The first level consists of those who are able to afford the high cost of education. Thus, they are financially fit to obtain education from either good public or private institutions of learning. This group will be lucky to get the best of ICTs in education (Ekong, Igwe and Ekong, 2005). The second group of learners consists of intelligent and competent students, who are unable to afford the high cost of education, but can obtain the little they can afford in less equipped public schools and later be competing with the first group. The third group of students (learners) consist of the academically poor learners who seek access to education from lower quality institutions of learning. The fourth and the last group of learners consist of the illiterates and the poor who cannot afford the cost of education at all and they are deprived. The whole intent of ICT used in education is to improve the system and ensure that the recipients acquire more saleable skills that will enable them become more functional are useful both to themselves and the society at large.

**Synchronous ICT media in education**

ICT in education could be viewed in terms of the technologies ie, in terms of the delivery system or in terms of their content. Based upon their delivery system (characteristics), ICT media technologies in education can be grouped into two categories, namely; synchronous and asynchronous media (Raddi, 2009). Focus in this piece will be on synchronous media. This type of educational media requires all participants to be together at the same time even though in different locations. Synchronous media permit every learner to take part in the learning (class) all at the same time (Sife and Lwoga, 2007). Thus, synchronous learning are usually supported by synchronous ICT facilities. Through the use of the synchronous media, for example; students watch a live streaming of a class. They take part in a chat and students and instructors participate in the class with the help of web conference tools such as blackboard-collaborate, Adobe connect, WebEx, Skype, etc (Collis and Jung, 2003), synchronous online classes therefore, are those that require student and instructors to be online all at the same time. Lectures, discussions and presentations occur at a specific hour. All students must log-on at that specific hour in order to ensure their participation (Bates, 2000). Many students like synchronous classes and class media because they feel involved, in real time, with the class experience. Through the media, they can ask questions or make contents, and they can receive instant feedback. Thus, most students believe that synchronous learning powered by synchronous ICT media are real time communication which allows for more fruitful discussion (Kling, 2001). In this understanding, synchronous ICT media (or class elements) in education may be classified to include:

- **Chat (text only):** Synchronous chat rooms allow multiple users to log on and interact. This is a great way to ask questions and to share resources and insights (Librero, 2006). The only drawback is that when there are a lot of people logged in, and everyone’s trying to chat at the same time, the conversation can break off into tangents. The fast typists are definitely rewarded. If you are participating in a chat session, be sure to save the session (archive it), and review it later. You can usually save it as a text or rtf file (Hon-chan and Mukherjee, 2003).

- **Voice (Telephone or voice-over IP):** Sometimes you will be asked to dial into a toll-free number, or to log into a website where you will speak through your built-in microphone or a headset. The purpose is to have a conference call with your instructor and fellow students. You may be reviewing a document or a presentation. In that case, it is extremely helpful to plan ahead of time and have all the documents you will need at your fingertips (Leach, Ahmed and Power, 2005).

**Video conferencing:** Video conferences can, in theory, require all the participants to have their webcams running. The conference administrator can then post everyone’s head shot in the screen. This is not usually the case though, because to have everyone’s webcam turned on and transmitting images requires a very fast connection and a lot of bandwidth. Usually, a video conference (or web conference) will involve two webcams operating – the instructor’s and that of another key person. A video conference can involve a live feed from a classroom or
elsewhere. Alternatively, the conference might transmit a presentation of slides and graphics, with a question and answer session at the end (Warschaver, 2009).

- Web conferencing: What differentiates a web conference from a video conference is the fact that you will probably not rely on video as your primary instructional content (Shortidge, 2012). Instead, you are likely to access a wider variety of media elements. Web conferences tend to be more interactive, and you will probably be asked to respond to questions (survey, poll, questionnaire), which will give you a chance to interact. Web conferences usually incorporate chat and they often have a question and answer session at the end.

- Internet radio/podcasts: When there is not sufficient bandwidth to broadcast live video of an event, instructors might stream the audio over the internet. Good opportunities for audio streaming include concerts or political speeches. Ideally, the audio file would be archived for students to access and review later as well. The nice thing about internet radio/streaming audio is that students can send chat messages while the event is happening (Kling, 2001).

- Virtual Worlds: Educational “Islands” in virtual worlds like Second Life are wonderful places for students to meet “live” and to interact. They are idea for learning languages because it is possible to speak with each other through headsets and VoIP. It is a wonderful way to practice conversation while being immersed in a virtual place that has the look and feel of another country or culture. While virtual worlds can be very engaging and productive as learning environments, they can be frustrating for those who are new. There is quite a learning curve as you learn to navigate the worlds, and to clothe and operate your avatar. Students should also bear in mind that virtual worlds require significant bandwidth along with a computer that has a lot of usable memory and a great video card.

The Effectiveness of ICT in education

The discussion above shows that ICT is a very powerful tool in education delivery and activities. ICTs are potentially powerful tool for extending educational opportunities, both formal and non-formal, to previously underserved constituencies scattered, and rural populations, groups, traditionally excluded from education due to cultural or long standing social reasons such as ethnic minorities, girls and women, persons with disabilities, and the elderly, as well as others who for reasons of cost or because of time constraints are unable to enroll in school (Leach, Ahmed and Power, 2005). ICT effectiveness in education is perceived from the following:

a. It could be accessed anytime, anywhere: One defining feature of ICT is their ability to transcend time and space. ICT makes possible asynchronous learning, or learning characterized by a time lag between the delivery of instruction and its reception by learners (Librero, 2006). Online courses materials, for example, may be accessed 24 hours a day. ICT based educational delivery, example educational programming broadcast over a radio or television, also dispenses with the need for all learners and instructors to be in one physical location (Warschaver, 2009). Additionally, certain types of ICTs such as teleconferencing technologies enable instruction to be received simultaneously by multiple, geographically dispersed learners (Collis and Jung, 2003).

b. Access to remote learning Resources: Teachers and students no longer have to rely solely on books and other materials in physical media housed in libraries for their educational needs. With the internet and world wide web, a wealth of learning materials in almost every subject and in a variety of media can now be accessed from anywhere at anytime of the day and by an unlimited number of people (Sife, Lwoga and Sanga, 2007). This is particularly significant for many schools in developing countries, and even in developed countries, that have limited and outdated library resources. ICT also facilitates access to resource persons, mentors, experts, researchers, professionals, business leaders and peers all over the world (Hon-chan and Mukherjee, 2003).

c. ICT help to prepare individuals for the work place: One of the most commonly cited reasons for using ICTs in the classroom has been to better prepare the current generations of students for a workplace where ICTs particularly computers, the internet and related technologies are becoming more and more ubiquitous (Bates, 2000). Technological literacy, or the ability to use ICTs effectively and efficiently, is
thus seen as representing a competitive edge in an increasingly globalizing job market

d. Benefit for teachers: ICT facilitates sharing of resources, expertise and advice, greater flexibility in when and where tasks are carried out; gains in ICT literacy skills, confidence and enthusiasm. Easier planning and preparation of lesson and designing materials, access to up-to-date pupil and school data, anytime, anywhere. Enhancement of professional image projected to colleagues, students are generally more “on task” and express more positive feelings when they use computers than when they are given other tasks to do. Computer use during lessons motivates students to continue to learning even outside school hours.

e. The use of ICT help to improve the Quality of Education: ICT can enhance the quality of education in several ways; by increasing learner motivation and engagement, by facilitating the acquisition of basic skills and by enhancing teaching training (Yanosky and Harris, 2010). ICT are also transformational tools which, when used appropriately can promote the shift to a learner centered environment.

Issues for consideration on ICT use in education

When a decision is to be taken to use ICTs for educational purposes, we must be able to define and describe for what purpose the content will be used and also be very clear as to what delivery system we are going to use (Kling, 2001). Such a decision should not be based on the technologies but on the conditions and contents in which we seek the use of ICTs e.g, access to media by the learners etc. Factors that will determine the choice of ICT use in education, and of the content are important. We must ensure that there is adequate reach and access. Thus, certain issues crop-up while considering the type of technologies to use in education in (Reddi, 2009). These issues include;

a. The Issues of Access: This implies a way of entering or reaching a place. This issue is on whether ICTs can get to remote educational areas. What is the possibility of penetrating ICT education facilities into the rural areas? Can ICTs be made available to reach those rural areas? Another important conception here is whether the users will be given the ample opportunity or the right to use the gadgets. Access or reach is a very vital issue of attention while discussing ICT in education. In fact, access or reach has often posed a very big challenge to government, education official, teachers and students. Access or reach of ICT use in education is often influenced by such factors as poor funding, illiteracy, time, mobility and perceived relevance and awareness.

The Issue of Technology and People Driven Education: The use of technology today is gradually gaining more and more relevance in every field of study including education. Activities and processes in education today is being driven by both technology and technocrats. The issue of ICT in education is already on ground but the issue of people (technocrats) need therefore, to be addressed. Thus, the choice and use of ICTs in education depends upon the investment in human capital development first. Are computer experts on ground ie. Those who can effectively use the gadgets.

Content Matters: What is the nature of content to be delivered is a major question to be answered. There are specially areas of content development that merit attention. These include: relevant, timely, local content and suitability. Content takes time and costs money to produce. Multimedia content suitable to be used by new ICTs takes longer and costs more. For instance, if we have to deliver content or knowledge in local language, in this part of the world, even fonts in local languages are not readily available, and if available cannot be integrated easily in to existing multimedia packages easily.

d. The issue of Participation: ICTs used for educational delivery are very numerous both in structure and in function. Consideration for procurement and use should also take into cognizance the convenience of the participants. Teachers and students activities in the teaching and learning processes should therefore, be properly enhanced by the ICTs considered for use in education.

The issue of Appropriateness: Educators in many ICT based effort in education, have yet to determine what is the most appropriate medium to deliver knowledge. Appropriateness of medium and content is related to the issue of access or reach. Thus, ICTs for use in education must be appropriate enough to underscore its relevance, acceptability and usability.

e. The issue of support and sponsorship: This focuses on government and private participation and partnership in the provision of ICTs for education.
Government therefore, should be ready to sponsor ICT use in education. Again private partnership should also pick interest to support the use of ICT in education. This may be achieved through appropriate government policies that can focus private and non-governmental organizations focus on providing ICTs to educational institutions within their environs.

**ICT generated changes in education**

ICT in education is innovation which all countries are trying to embrace in this emerging world of technologies. Today, different ICT are found in institutions of higher learning and infact, in almost all facets of human endeavors. Redid (2009) noted that like all innovations that we have come to accept, ICTs also have strengths or positive changes and new activities it has generated into the education system. Some of these new changes or activities include:

a. **Individualization of instruction:** This means that people learn as individuals and not as a homogeneous group. ICT allows each individual to relate to the medium and its content especially at his convenience.

b. **Interactivity:** ICT permit each individual user to interact with the content, units, etc. or to interact with another learner else where without attending to classes. Interactivity is also a way in which a person can relate to the content, ie. Go forward and backward in the content, start at any point depending upon prior knowledge instead of always in a sequential way (Kisilowska, 2002).

c. **Low per unit cost:** With ICT in education, the cost of education – both delivery and personal resources requirement is far reduced. For instance, where there is complete access, provision of personal computer and good network system, the purchase of textbooks and exercise books may be far reduced. All information and data can easily be accessed through the net. With this, per-person, ICTs tend to reduce the cost of education from very high to very low cost especially in the procurement of basic personal (education) resources like books, etc (Ekong, Igwe and Ekong, 2005).

d. **Distance and climate insensitive:** ICT does not matter where you are, or how the whether is, you can still access and learn from it. The basic condition is that there must exist network interconnectivity and easy access.

e. **Multiple Teaching Function:** ICT can serve multiple teaching functions to diverse audience. For instance, ICTs especially the computer and internet based can be useful in drills and practices; to help diagnose and solve problems, for accessing information and knowledge about various related themes.

f. **High Speed Delivery:** ICT has very high speed delivery as well as wide reach at low cost. Thus, there is usually instant delivery of information especially when one tries to gain information through the web.

g. **Uniform Quality:** If content is well produced and is of good quality, the same quality can be delivered to the rich and the poor, the urban and the rural equally at the same time (Fathi and Azadmanesh, 2007).

**General impact of ICT on education**

Haddad (2008) noted that globalization and technological change processes that have accelerated progressively over the past few years have created a new global economy, powered by technology, filled 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 half-life of information continues to shrink and access to information continues to grow exponentially, schools cannot remain mere venue for the transmission of a prescribed set of information from teacher to student over a fixed period of time. Rather schools must promote “learning to learn,” that is, the acquisition of knowledge and skills that make possible continuous learning over time. In so doing, concern over educational relevance and quality coexist with the imperative of expanding educational opportunities to those made vulnerable by globalization. Thus, the experience of introducing ICTs in the classroom and other educational settings all over the world suggest that the full realization of the educational benefits of ICT will be gradually unfolding. It is therefore, imperative to assert that ICT will continue to impact on education positively in order to ensure the realization of its relevance in this regard, some of the key issues to face educators and education policy makers in this instance include:

a. **The Impact of ICT on Learning and Achievement:** Kling (2010) noted that ICTs can empower teachers and learners, making significant contribution to learning and achievement. ICT can facilitate teaching considerably in many disciplines. Studies have not shown clearly the impact of ICT on
students or pupils' academic achievement. But it is on record that the use of ICTs in the teaching and learning of ICT related subject can considerably enhance both instruction and the learning achievement of students in those ICT related subjects. On the other hand, it is clear therefore, that more research need to be conducted to understand the complex link between ICTs learning and academic achievement.

b. Impact on Teacher and Teaching: The use of ICTs in the classroom or in distance education does not diminish the role of the teacher, neither does it automatically change teaching practices. Experience has shown that a variety of support and enabling mechanisms must be implemented to optimize teacher use of ICTs. While traditional teacher leadership skills and practices are still important, teachers must also have access to relevant, timely and ongoing professional development. They must have the time and resources to explore this new knowledge base and develop new skills.

c. Impact on Content and Curriculum: Accessing information is the main use of ICT in education. While ICTs, and the internet in particular, provide access to a format that makes them easily accessible and relevant to most teachers and learners in developing countries. Simply importing educational content through ICTs is fraught with difficulties, as well as questions of relevance to local needs. Experience shows that unless electronic educational resources are directly related to the curriculum, and to the assessment method used to evaluate educational outcomes, ICT intervention may not have positive educational impacts.

d. Impact on Education Research and Development Work: Research and development is integral to the informed use of ICT for education. However, aside from being the subject of research itself, ICTs can also be used to gather much needed data on geographically distributed subjects such as students, university staff in learning center. This implies that surveys are now being conducted online through e-mail, online interview, using all forms of audio and videoconferencing. Collecting and analyzing data is also being automated using appropriate software for data analysis, survey questionnaires can be downloaded and submitted online and tabulation of data fathered can be automatically integrated and analyzed with statistical software.

e. Impact on School Management and Administration: ICT does not only impact teaching and or instruction alone. Use of ICT is equally vital in facilitating and coordinating communication and other management and administrative functions the school. The specialized areas where ICT could be used by school management and administration include:

- Students Document Tracking System: Through this system prospective candidates for admission can obtain admission forms online, submit their applications online, receive acknowledgement of receipt, track the progress of their application and receive results or outcome of their application.
- Online Registration System: ICT allows the online registration of students. The online registration system allows the students to enroll in courses at their own convenience, typically complete registration forms within the prescribed period.
- Online Submission of Grades: ICT gadgets can also assist management in education institutions to achieve online submission of grades by instructors after student’s evaluation. This system is especially useful for both regular, adjunct and contract academic staff members. Online access to official students enrollment lists are also made available in this system. Where this obtains, ICT gadgets can equally enable teachers and instructors to post students interim continuous assessment and final grades for immediate release to students.
- Digitalization of Student Records: Many universities today have completed all necessary ICT processes and are now using digitalized students records. In such schools, students bio-data are all accessible through the net. Indeed, a typical student accumulates a variety of records over his/her academic life time. Clearly, the storage of physical records not only takes up a lot of space; it can lead to nightmares as one seeks to retrieving old students records.

Disadvantages of ICT application in teaching and learning
Although the use of ICT in education is a worthwhile endeavour, there exist certain risks in the application of ICT in education, especially in teaching and learning. These associated risks include:
1. Viruses attack to data and academic records can easily destroy data or information stored.
2. Sabotages, intended manipulations and information stealing.
4. The destructive effect of missing the culture of using ICT in education.
5. The missing of the technical substructures which are necessary for the education and evaluation based on ICT.
6. The interruption of electricity and computer network in time of teaching, examination or transmission of educational matters.
7. Disappearing of all the information of faculty, departments, professors, lecturers, and other vital data or information all at once.
8. The missing of enough security in computer systems and weakness to control them.
9. The absence of transmitting positive values and also teacher-students interaction.
10. More attention to quantity and more speed in education instead of quality and training.

**Conclusion**

ICT use in education is challenging. The countries world over pursue the priority agenda of ICT use in their education system. Globally, it is believed that national development today is found in a nation’s power and skill to use ICT effectively. Effective use of ICT in education helps to train the needed manpower who are able to compete at international plain. Thus, ICT will continue to re-skill the workforce needed for the dynamic development of every nation. Nations especially the developing countries left behind in the struggle for ICT skill and ICT use in all facet of their endeavour, especially the education system will definitely suffer the bitterness of economic backwardness in the nearest future. Nigeria as one of the developing nations should not stop at the little effort so far made in ICT use, but should rather strive to cover more grounds in ICT use and innovations.

**Recommendations**

Functional ICTs in the school or education system may be enabled by many factors. These factors include among others the following (Vajangah, Jahani and Azadmanesh, 2008):

1. Providing computer literacy training for university (education) personnel.
2. The academic familiarity with computer software that can help them in teaching and learning activities.
3. The academic familiarity with internet and the way of using it.
4. The academic access to personal computers in their homes or offices.
5. Keeping academics informed on new and effective ICTs instruments and equipments.
6. Improving academic beliefs and views through workshops and seminars on the potential positive impacts of ICTs features on improving the higher education.
7. Availability of a well designed website or even an equipped class with PCs, video projectors and the other necessary equipments.
8. The possibility of having enough budgets in faculty to equip the class and prepare necessary equipments.
9. The presence of moods, cooperative motivations and enough coordination in education institutions’ personnel for entering into new atmosphere.
10. Encouraging students to attend and participate in workplaces and labs to use ICT features.
11. Supporting students with financial resources.
12. Encouraging students to procure personal computers in their homes or places of abode.
13. Constantly improving students’ abilities in computer literacy.

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