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Challenges to Effective Utilization of Information and Communication Technology in Teaching and Learning

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ABSTRACT

The study looked at the Challenges of information and communication technology on teaching and learning basic science and technology in primary schools. The use of ICT in teaching is becoming increasingly vital owing to the global nature of the twenty first century teaching and learning. It was found that the use of modern technology such as ICT offers many means of improving teaching and learning in the classroom. It also has the potential to support education across the curriculum and provide opportunities for effective communication between teachers and students. From extensive review of literature, it was found that the major challenges to effective utilization of ICT in teaching and learning of basic science and technology in primary schools are: lack of confidence, lack of competence, lack of access, inadequate time etc. The implications of the above challenges to Universal Basic Education were highlighted, and recommendations were proffered.

KEYWORDS: Information and Communication Technology, Teaching, Learning, Basic Science and Technology

Introduction

The literature dealing with technology attests to the powerful impact information and communication technology (ICT) can have on the teaching and learning process. According to Zhang & Aikman cited in Khalid (2009), Information and communication technology has become an important part of most organizations and businesses these days. The use of ICT in teaching is becoming increasingly vital owing to the global nature of the twenty first century teaching and learning. In line with this, Lefebvre, Deaudelin & Loiselle, (2006), opined that the use of modern technology such as ICT offers many means of improving teaching and learning in the classroom. Dawes (2001) is of the view that new technologies have the potential to support education across the curriculum and provide opportunities for effective communication between teachers and students. These potentials have implications for education in the sense that they will bring about changes in the teaching methodology in line with the demands of the 21st century.

Teaching of basic science and technology is more effective with the use of ICT since ICT is a product of science and technology. According to Achor (2003), ICT becomes an adopter when it leads to multiple applications and manipulation to produce relevant models for teaching of basic science and technology. At primary level of education, science is being taught as basic science and technology. Primary level of education comprises pupils of age range 5-12 years. At this level of education, the use of ICT as a medium of instruction is paramount for the fact that primary level of education is the basic for all the other levels. Achor (2003) stated that age and its attendant characteristics hold that children in primary school are concrete operators requiring real, model or illustrative objects to learn better at that level. Similarly, children of primary school age respond positively when motivated to learn especially when the source of motivation is also the object or concept to be studied. For example, the concepts of electrons in electricity, waves, diffusion etc. can be learnt better by the pupils when projected on the screen by the use of ICT resources.

Basic science and technology is concerned with three broad areas: energy and forces; materials; and living things, which lay the foundations for physics, chemistry and biology respectively. Whilst these are the broad areas of study, basic science and technology is not just concerned with knowledge, but more particularly with the scientific method and the effect of the use of this method on the individual child Basic science and technology has three aims: to develop scientific process skills, to foster the acquisition of concepts and to develop particular attitudes. These aims will only be achievable when appropriate methodologies such as ICT usage are employed for teaching. However, the use of such novel methodologies for instructional delivery might meet with obstacles for obvious reasons which this paper intends to explore. The paper therefore intends to review the major challenges to effective utilization of ICT in the teaching and learning of basic science and technology in primary schools and their implications for achieving the objectives of the Universal Basic Education in Nigeria.

ICT and Basic Science and Technology Teaching and Learning in Primary Schools

The use of ICT for preparing learners to function effectively and be productive in the society cannot be overemphasized. Yelland cited in Khalid (2009) claimed that organizations that do not incorporate the use of new technologies in schools cannot seriously claim to prepare their pupils for life in the twenty-first century. Teaching with ICT in the primary schools prepares the pupils to face the future developments based on proper understanding. Osborne and Hennessy (2003) stated that the latest move towards teaching about science rather than teaching its content will require a significant change in its mode of teaching and an improved knowledge and understanding in teachers. Several studies have revealed the importance of ICT for science learning. One of such benefits is that ICT encourages communication and collaboration in science research. According to Gillespie (2006) new technologies can be used in primary basic science and technology education to enable pupils to collect science information and interact with resources, such as images and videos, and to encourage communication and collaboration among the pupils. Other researchers indicated that new technologies may also help to increase pupils' motivation, (Osborne & Collins, 2000).

Murphy (2006) on a review of the impact of ICT in basic science and technology education noted that the internet can be used in the basic science and technology both as a reference source and as a means of communication. Mavis and David (2003) opined that features of ICT, such as its speed and flexibility can make a significant contribution to pupils' knowledge, understanding and skills in science. The use of ICT can extend and enhance pupils understanding of science through: simulations and modeling, to help pupils understand phenomena which may be too slow, too fast, too dangerous or too expensive to carry out in the school laboratory, to allow pupils to investigate the effects of changing variables in the situations represented or to consolidate and reinforce conceptual understanding (Baggot, Mctarlene, & Brown 2003).

Despite the aforementioned impacts of ICT to teaching and learning of science, effective utilization of it is being impeded by some challenges. Becta (2004) opines that five factors influence the likelihood that good ICT learning opportunities will develop in schools. These include: ICT resources, ICT leadership, ICT teaching, school leadership and general teaching. Becta also indicated that the successful utilization of ICT in basic science teaching varies from curriculum to curriculum, place to place, and class to class, depending on the ways in which it is applied.

Challenges of ICT Usage in Teaching and Learning of Basic Science and Technology in Primary Schools

The effective utilization of ICT in the teaching and learning of basic science and technology is a complex process and it is one that may encounter a number of challenges. Some of these challenges are;

Lack of Teacher Confidence: This can be attributed to the fact that some of the teachers are not ICT compliant. Some studies have investigated the reasons for teachers' lack of confidence with the use of ICT for teaching. For example, Beggs (2000) attributed it to teachers' fear of failure. Balanskat, Belmire & Kefala (2006) attributed it to anxiety due the limitations in teachers' ICT knowledge while Becta (2004) observed that many teachers lack the requisite skills for using ICT. Becta in a survey, found out that many of the teacher respondents who identified their lack of confidence as a challenge, reported being particularly afraid of entering the classroom with limited knowledge of ICT where some of the pupils were better than them.

Lack of Teacher Competence: In Nigeria, studies have shown that many primary school teachers are far from being literate in ICT. Harbor-Peter (2001) and Akudolu (2002) studies revealed that 95% of mathematics teachers in Nigeria are computer illiterate. It is obvious that such teachers will find it extremely difficult to deliver the appropriate education and training demanded by the information age of the 21st century for their pupils (Salau, 2003). Newhouse (2002) found that many teachers lacked the knowledge and skills to use computers and were not enthusiastic about the change and integration of supplementary learning associated with bringing computers into their teaching practices. Similarly, Balanskat, Balmire and Kefala (2006) revealed that most of the teachers still chose not to use ICT and media in teaching situations because of their lack of ICT skills rather than for pedagogical/didactic reasons. Hence, lack of competence is a serious challenge to the use of ICT and might lead to resistance to change.

Resistance to Change and Negative Attitudes: Most of the studies on the challenges of the use ICT in teaching have shown that teachers' attitudes and resistance to change were significant challenges (Schoepp, 2005). Schoepp's (2005) study indicates that although teachers felt that there was more than enough technology available, they did not believe that they were being supported, guided, or rewarded in the integration of technology into their teaching. According to Empirica (2006), teachers who are not using new technology such as computer in classroom are still of the opinion that the use of ICT has no benefits.

Lack of Effective Training: Training of teachers is a necessary condition for the effective use of ICT in teaching and learning. Where such training is lacking it tends to impose a serious challenge to effective use of ICT in teaching and learning. In most of the primary schools in Nigeria, training of the teachers in the use of ICT has not been taken as a paramount issue. Issue of training is certainly complex because it involves the consideration of several components to ensure the effectiveness of the training (Becta, 2004). These components are time for training, pedagogical training, skills training and an ICT use in initial teacher training. Similarly, Gomes (2005) concluded that lack of training in digital literacy, lack of pedagogical and didactic training on how to use ICT in the classroom, and lack of training concerning the use of technologies in science specific areas were challenges to using new technologies in classroom practice.

Lack of Accessibility of ICT Resources: Accessibility to ICT resources is another serious challenge to the use of ICT in teaching and learning. Several studies indicate that lack of access to resources, including home access, is another complex challenge that discourages teachers from integrating new technologies into education and particularly into science education. According to Achor (2003), many local government headquarters in Nigeria do not have functional telephone system. This situation is even worse in villages. Many of them also are not linked with digital telephone which makes infusion of ICT into our educational programme easy. According to Salau (2003), over 90% of schools in Nigeria are without ICT tools including the internet. Lack of accessibility can also be in form of few number of computers for teachers use, lack of internet facilities, insufficient number of copies of software and insufficient simultaneous internet access.

Lack of Technical Support: In most of the primary schools in Nigeria today adequate technical support for the use of ICT has not been achieved. Salau (2003) noted that Nigeria needs to educate and produce about one million cutting-edge computer Scientists and Engineers annually and perhaps five million computer literate ICT users annually to compete with the rest of the world. Silica (2005) noted that technical problems were found to be major challenge for teachers' use of ICT. These technical problems include waiting for website to open, failing to connect to the internet, printers not printing, malfunctioning of computers and teachers having to work on old computers.

Implications for Universal Basic Education in Nigeria

The implications of the above challenges for UBE are as follows:

1. Lack of confidence and competence in ICT will result to inefficient and ineffective teachers in the system which will not be able to achieve the objectives of the UBE programme of imparting appropriate knowledge and skills to the pupils.
2. Resistance to change especially where there is no legislative backing will lead to teachers' insistence on conservative ways of teaching. This will negatively affect learning and academic performance of the pupils.
3. Lack of training on the use of ICT for instructional delivery will mean that the teacher cannot deliver, since s(he) cannot give what s(he) does not have.
4. Lack of access to ICT resources will lead to frustration and job dissatisfaction, which may promote negative attitude to teaching and learning.
5. Lack of technical support will lead to poor maintenance of the ICT gadget/equipment and under-utilization of some of the available ones due to poor knowledge of their mode of operation.

Recommendations

Based on the above implications, the following recommendations were proffered:

- ICT should be made compulsory in Federal and State colleges of Education and appropriate courses selected to help teacher trainees gain experiences in dealing with the modern technologies and new pedagogical approaches.
- Training in ICT should be made compulsory for all serving teachers by the government who should organize regular workshops and seminars.
- Government should legislate ICT competence as a condition for employment of Primary School Teachers.
- Technical support need to be provided to schools by the government for maintenance of ICT gadgets.
- Schools must provide teachers with the necessary ICT resources including internet access, hardware and software.

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