INFORMATION COMMUNICATION TECHNOLOGY (ICT) AS A RESOURCE FOR THE TEACHING OF BASIC SCIENCE IN NIGERIAN JUNIOR SECONDARY SCHOOLS

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Abstract

Information communication technology (ICT) is an effective tool in teaching and learning, and has successfully turned the world into a global village. In line with this paper, ICT can serve as a resource for an effective teaching in basic science classrooms. Information Communication Technology (ICT) like other technologies can be used in a variety of ways and its usage depends on the user and the context. This paper therefore tried to briefly explain the concept of ICT and concept of teaching resource. Then attempted to explain the status of ICT in Nigerian Schools. Furthermore the paper also discussed about the Application of ICT in the teaching of basic science in Nigerian Schools, challenges faced in the optimal utilization of ICT in Nigeria. The use of ICT as an effective teaching resource in basic science is highlighted. The paper finally suggested that the use of Information Communication Technology (ICT) must be encouraged by teachers and various government agencies through the provision of teaching and learning materials like computers and the like. Non Governmental Organizations (NGOs) and Parent Teachers Associations (PTA) and other stake holders in education should provide adequate funding for the purchase of ICT facilities.

Information Communication Technology refers to any electronic means of capturing, processing, storing, and dissemination of Information. It is a combination of Information Technology (IT) and Communication Technology (CT). Hamza (2007) refered to Information Technology (IT) as the packaging and processing of Information, while Communication Technology (CT) involves the interaction, exchange, and linkage of Information and data base between users through networking. Hamza (2006) also defined ICT as the integration between computer and all sorts of electronic communication devices in order to enhance quicker access and dissemination of information.

Advances in Information and Communication technologies have brought about exciting opportunities for fundamental changes in education. Creating a vivid, playful, interactive learning environment with the support of multimedia presentations helps to provide an easy platform of learning that can support knowledge dissemination engagement or cognitive control. Suwaid (2013) asserted that children who learn informally through the use of technology devices seem to be high achievers at school as they give more meaning to such items they come in contact with, they develop more interest to complex toys and other machines with key pads and buttons. Modern Information and Communication Technology is very important in teaching and learning. For example the use of computers, television, radio, internet etc brings about easy access to information, making learning more flexible and interesting. The impact of Information and Communication Technology has been felt in the home, in the school, in the area of training, defence and security, finance and commerce, in the manufacturing industries, and in the offices etc.

Teaching Resources

Some science concepts are easier to impart when teaching aids are used in the teaching process. It is therefore assumed that the availability of teaching aids can foster understanding thereby reduces the teachers efforts of realizing the objectives of the lesson. Hence teaching or learning aids are materials or items that are relevant or clearly help to visualize the facts that are being presented during a particular presentation. They help to make learning easier and more interesting; they can be simple or complex, local or modern. Teaching Resources are materials that the teacher uses to deliver his instructions. Teaching resources can be classified into human and material resources. Human resources are humans that help in the provision of genuine information about the concepts being taught. While material resources are the resources that can be used to facilitate the understanding of scientific concepts. Material resources can be living or non living. Example of living resources includes plants, animals, and their products that can be obtained and used by the teacher. Non living resources are of various kinds for example visual and audio-visual aids etc. In another classification teaching resources can be classified into technology assisted tools and other local resources. The technology assisted tools can further be classified into simple technology tools like hammer, screw driver, knife, flier, and the like. While the complex technology tools encompass the computer, projectors, DVD, Television and various components of e- learning.

Basic science is the science taught at the junior secondary level in Nigeria. The syllabus of basic science is designed with a lot of activities, as such methods used for its teaching should be in such a way that it will allow the learner to learn through the activity based method of teaching National Teachers Institute (NTI) (2007) reported that methods of teaching basic science should include the guided discovery method

which is resource based. The mastery of basic science concepts cannot be fully achieved without the use of instructional learning materials; hence the teaching of basic science without learning materials will certainly result to poor academic achievement in the subject. Ideally a professionally qualified science teacher will not be able to put ideas into practice if equipments and materials necessary to translate competence into reality are lacking. Yusuf (2009) described instructional or teaching materials as those items used by the teacher to pass information to students. Achimugu (2000) posited that students comprehend and remember better when teaching materials are employed in the teaching-learning process. It is therefore envisaged that instructional materials if carefully and properly planned will enhance the teaching and learning of basic science, and consequently making it enjoyable, interesting, and exciting

Status of ICT in Nigerian Schools

The Federal Republic of Nigeria (FRN) has no specific policy on ICT in Education. Rather in February 2007 the Federal Ministry of Education created its own ICT departments after which several Government agencies and private sectors also initiated some ICT driven projects. Agyeman (2007) further explained that the use of ICT aided materials is not encouraging at all. Generally the integration of ICT into the Nigerian schools is minimal. Okebukola (1997) explained that the plan was to gradually implement ICT for usage into the Nigerian school system to some selected federal government colleges and thereafter spread the innovation to other secondary schools and later to primary schools. Unfortunately it was not a success. However Aduwa- Ogiegbaen, and Iyamu, (2005) narrated that in spite of the above, the International Telecommunication Union (ITU) has rated Nigeria's Telecommunication system the fastest growing in Africa.

Relevance of Employing ICT in the Teaching of Basic Science in Nigerian Schools

Research studies like Anthony (2002) and Abdullahi (2005) stated that in Africa, the teaching and learning of basic science is dominated by the lecture method and is thought to be the major reason for learning disability and lack of interest. Muoneme (2012) explained that the teacher and his method of teaching may have been the major cause of student's poor academic performance in basic sciences as most teachers still prefer using the "chalk and talk" method (the lecture method approach). Other factors leading to poor understanding in the basic science classroom is lack of trained teachers that can alter the conventional teaching methods to modern teaching strategies. Another factor to be identified is non use of appropriate instructional materials in the teaching and learning process. Ayeni (2005) and the National Centre for Science Education NCES (2006) reported that basic science education has undergone strains and stresses in Nigeria and is attributed to lack of appropriate teaching materials, and the teacher's failure to use effective teaching strategies.

The approach to science education should takes a view that science should serve as a medium through which a child might develop his natural curiosity and his power of problem solving and decision making. These are fundamental qualities of an inquiry and constructive attitudes to good qualities of education that have particular relevance to the Nigerian environment and which fosters the child's understanding of this world and his own potentials. A student of science that has acquired new knowledge should become a role player, a discoverer, a technician designing his own apparatus out of local in expensive materials, an experimenter, who arrives at his own answers and a scientist at heart. To ensure that these roles are maintained, the student should be kept busy observing, describing, classifying, inferring, predicting, experimenting, asking questions, measuring, communicating, interpreting data, and formulating hypotheses. All these mental exercises require materials. Thus it has become mandatory for all science teachers to use suitable resources in order to teach science concepts more effectively. In view of this, ICT should serve as an effective tool or resource that can help to impart science knowledge in Nigerian basic science classrooms.

Challenges Faced in the Optimal Utilization of ICT in Nigeria

Science and Technology are tools that form the bedrock of any meaningful scientific and Technological development of any nation. The greatest challenge facing Nigeria is that of survival of a system or technique. Another area of concern is that of availability and effectiveness of the usage of some specialized science equipments, facilities, and teaching aids. Abimbola (2001) narrated that generally in Nigeria one of the most striking problems of science education is that of inadequate science teaching materials. Abimbola (2001) further explained that the policy that introduced science into the Nigerian curriculum, introduced it as an activity based subject; which pre supposes that the teaching of sciences requires a lot of teaching and learning resources. Lack of infrastructures like laboratories, science equipments, services, and consumables that are necessary to teach sciences also forms one of the greatest challenges facing the country in general. Lack of trained teachers that are equipped with the newer teaching strategies in the field of sciences is another area of concern. These explained the need for this discourse that focused on the relevance of ICT as a learning resource in the effective teaching of basic science as a foundation for all the other sciences.

Various factors are responsible for the challenges facing the optimal utilization of ICT in Nigerian schools. The most significant among the various factors is the lack of ICT infrastructures, lack of ICT skills among teachers, Lack of policy on ICT in the Nigerian educational system, absence of electric power grids in most parts of the country, and to round it all up Iloanusi, and Osuagwu (2005) further explained that inadequate funding and lack of technology budget to the government institutions has helped to exacerbate the problems of ICT in various government institutions.

The Use of ICT as an Effective Teaching Resource in Basic Science

The fundamental factors influencing the use of ICT in the process of teaching and learning have been identified in the form of five technological attributes, namely:-

- User and Content characteristics
- Technological considerations
- Organizational capacity
- Theories of learning and
- School polices

All these constitute the factors that would influence the adoption and integration of ICT into the teaching and learning process. For example in the area of learning theories McInemey and Slavin (1995) suggested that the focus of teaching is that of guiding the students, as they build and modify their existing mental models, which denote a focus on knowledge construction rather than knowledge transmission. They explained that constructivism as a paradigm of learning is founded on the premise that by reflecting on past experiences one can construct his/her own understanding of the world his/her live in, generate his/her own rules, and design his/her own mental models which he/she can use to make sense of his/her experience. In another assertion more moderate constructivist like Formal instruction is appropriate, but students should engage in thought oriented activities to allow them to apply and generalize the information and concepts provided in order to construct their own model of the knowledge. Constructivism is undoubtedly a major theoretical influence in contemporary science education. Although it began as a theory of learning, it has progressively expanded into becoming a theory of teaching, theory of education, theory of the origin of ideas, and a theory of both personal and scientific knowledge. Hence it has become an educational version of the grand unified theory. In view of the above it has become pertinent that the adoption of ICT in science education classrooms in general and basic science in particular will serve as a very good teaching resource that will boost the morale of students and create more interest in science learning in Nigerian schools.

More over some pedagogical theories like the cognitive view of learning, the constructivist view of learning, to mention but a few were formulated in support of Information and Communication Technology (ICT) in the process of teaching and learning. The cognitive theory of learning states that for learning to take place students actively process information by making efforts to organize, store, and find relationships between information linking new to old knowledge, schema, and scripts. In essence cognitive theory emphasizes the way information is being processed. Ausubel, Bruner, and Gagne the three exponents of cognitivism consider learning being a form of information processing. Thus, Ausubel considers the impact of prior learning as a decisive factor in information processing. Bruner's work on categorization or forming of concepts involving three stages (enactive, iconic, and symbolic) provides a possible

set of answers on how the students derive information from the environment. He further argued that subject structure must be taught and also advocated the introduction of the real process of a particular discipline to students. While Gagne look at the events of learning and instruction as a series of phases using the cognitive steps of coding, storing, retrieving and transferring information. Cognitive theories emphasized the active and mental process on the part of the student, all of which are embedded in Information Communication Technology (ICT), therefore ICT is expected serve as the best teaching resource in Nigerian schools.

Recommendation

- The use of Information Communication Technology (ICT) must be encouraged by teachers and various government agencies.
- Teaching and learning materials like computers should be provided by government and private school owners.
- Non Governmental Organizations (NGOs) and Parent Teachers Associations (PTA) and other stake holders in education should provide adequate funding for the purchase of teaching resources like computers and the like.
- The use of ICT in learning helps to visualize scientific facts, therefore ICT must be included into the science curriculum and other related subjects.
- Professional associations like Science Teachers Association (STAN), Mathematics Association of Nigeria (MAN), and research centers like Nigerian Educational Research Centers (NERDC), should try to in cooperate ICT in the science curricula both at the junior and senior secondary school level. As well as organize seminars and workshops that will help in teachers professional developments.
- On individual basis science teachers should try to be computer literate.

Conclusion

The paper has explained that Information Communication Technology (ICT) can serve as a very good teaching resource that can be employed in the teaching and learning of basic science in Nigerian schools, as it will help to visualize and organize learning in general.

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