THE NEED FOR THE INTEGRATION OF INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) INTO NIGERIAN SENIOR SECONDARY SCHOOL (SSS) PHYSICS CURRICULUM: A SURE WAY FOR EFFECTIVE TEACHING AND LEARNING OF PHYSICS

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Abstract

Information and Communication Technology (ICT) has become a global issue of discourse in almost all aspect of human endeavour including teaching and learning. Effective teaching and learning of physics in this modern world can easily be carried out using information and communication technology gadgets. Unfortunately, Nigerian secondary school science teachers including physics teachers are still teaching using chalk and black board. This scenario demands the need for the integration of ICT into secondary science curriculum particularly the (SSS) physics curriculum. This paper therefore is focused on the concept of information and communication technology (ICT), the philosophy and objectives of (SSS) physics Curriculum, the relevance of integration of ICT to the teaching and learning of physics, challenges and the way forward.

Introduction

The world is been driven and controlled by information and communication technologies. Information and communication technology has permeated through all aspects of human endeavour including the act of teaching and learning. Effective teaching and learning of science including that of physics can easily be carried out in today's modern world using information and communication technology (ICT) facilities. For example the guided discovery method of teaching emphasized in the (SSS) physics curriculum can easily be done using (ICT) facilities. In the guided discovery method of teaching physics, the teacher can provide the students with the general principle, and the students on their own part can make use of modern technology facilities like the computers and the internet to find solutions to the problems given. Effective learning of science according to Nwosu (2003) occurs when learners develop the ability to purposefully access information from a variety of sources, analyse and evaluate the information and then integrate into the construct a personal knowledge base from which to make intelligent decisions. All these are made possible by the internet (Owolabi and Dansu, 2006).

Because of the importance of information and communication technology, every country craves for it. There is a universal recognition of the need to use information and communication technology (ICT) in education as the world enter the era of globalization where free flow of information via satellite and the internet hold sway in global information of knowledge (Aduwa-Ogiegbaen and Iyamu, 2005). They further said that Nigeria is on the wrong side of the international digital device, as it has not made significant effort to integrate (ICT) into secondary schools curriculum. According to Anyebe (2008) African countries are not left out of the deluge of ICT. In Ghana, the world link program is saddled with the responsibility of linking secondary schools (SS) to the internet and integrating ICT into its classrooms under the school net project. "The Ghana pilot scheme begun in 1997... each school is equipped with fully furnished computer laboratory with local area network connected to the internet" (International Labor Organisation) [ILO], national initiative concern ICT-Ghana 2000).

In the same vein, in August 2004, Egypt's prime minister evolved an economic development strategy targeted at explicating economic strategy through the machinery of a dynamic ICT sector Ministry of Communication, Information and Technology Egypt, 2005. Inspite of all these efforts by African countries to revolutionize their educational system by way of integrating ICT into their school system, Nigeria the alleged giant of Africa and the number six largest producer of crude oil in the world has not made any significant effort towards that direction. Nigerian classrooms are ICT sick and the only panacea is a witty integration of ICT in them in order to evoke a pedagogical transformation and revolution, (Anyebe, 2008).

The Concept of Information and Communication Technology (I.C.T.)

The acronym ICT simply means information and communication technology. The abbreviated letters I.C.T. could be defined separately as:
• I: - This stand for information which means the process of getting facts or details about a particular thing.
• C: - This stand for communication which refers to the process of passing or transmitting
information from the sender to the receiver using appropriate channel.

• T: - Stand for technology which refers to the practical application of science knowledge to solve practical real life problem.
  - Ehikhamenor (1993) viewed I.C.T as a technique and equipment that facilitates the acquisition, recording, processing, storing, reception, transmission and retrieval of information using electronic gadgets.
  - Olakulehin, (2007) categorized the used of information technologies in the educative process in two broad areas,
    i. ICTs for education and
    ii. ICTs in education
  - According to him, ICTs for education refers to the development of information and communication technology specifically for teaching/learning purposes, while ICTs in education involves the adoption of general components of information and communication technologies in teaching and learning process.
  - On his own part, Maigoro, (2008) believes that I.C.T could be categorized into three i.e. most recent type thus:
    i. Information technologies which uses computers and have become indispensable in modern times to process data so as to save time and effort,
    ii. The second is telecommunications technologies which include telephones and broad casting and radio and television through the use of satellite and iii. The third is net-working technology and best known in this category so far is the internet, intranet and satellite communication.
  - Summarily, ICT could be regarded as all the technological gadgets used for gathering storing, processing, distributing, manipulating, updating, analyzing and retrieval of information that are needed by man.

The Philosophy and Objectives of (SSS) Physics Curriculum

Physics is the study of matter in relation to energy. The knowledge of physics is required for the study of engineering and some science related subjects. The physics curriculum content grew out of a draft developed by the Comparative Education Study and Adaptation Centre (CESAC) and was presented to a National Critique Workshop organised by the Federal Ministry of Education, Science and Technology in December 1984.

The general objectives of the physics curriculum as stated in the curriculum document (FME, 1985) are:

i. To provide basic literacy in physics for functional living in society,
ii. To acquire basic concepts and principles of physics as a presentation for further studies,
iii. To acquire essential skills and attitude as preparation for the technological application of physics,
iv. To stimulate and enhance creativity. Apart from the general objectives, an array of performance objectives was also stated for each topic and the performance objectives are easily measurable in the way they stated to allow for easy evaluation Ogunleye (1999).

Ivowi (1993) listed some factors that were emphasized in the SSS physics curriculum content as:

i. Understanding of concepts (i.e. ability to explain concepts and principles),
ii. Functionality (i.e. the use of functional equipment in order to expose students to the various processes and to enable them acquire relevant skills, iii. Application (i.e. ability to apply concepts learnt and skills acquired in relevant situations).

Also to warrant the achievement of the objective guided discovery method of teaching was recommended. Ample opportunity for laboratory activities and the discussion were provided in every unit of the course. In the same vein, to achieve objectives of the SSS physics curriculum, there is need for the integration of ICT in the curriculum. This is because the guided discovery method of teaching which was strictly emphasized in the curriculum can be carried out through the use of information and communication technology gadgets. For example, a physics teacher who is engaged in guided discovery method of teaching can provide the students with the general principle and the students on their own part can make use of modern ICT facilities like computer and internet to search for the solution of the problem in question. No wonder Nwosu (2003) opined that effective learning of science occurs when learners develop the ability to purposefully access information from a variety of sources, analyze and evaluate the information and then integrate into construct a personal knowledge base from which to make intelligent decisions. Some concepts of physics like electricity, waves, conduction and radiation can be effectively taught using the computer power points.

A trained physics teacher can make use of computer power points to demonstrates or illustrate to his students the conventional flow of electric current in a circuit. Thus, the internet is an important technological tool for promoting engaged learning since it contains vast amount of science resources for teachers and students at all levels, Osisioma, Bandele and Colley (2006).
The Relevance of I.C.T Integration to the Teaching and Learning of Physics

The use of information and communication technology (ICT) in the teaching and learning of physics can be relevant in the following ways:

i. **Aids Understanding of Physics Concepts**

   The use of information and communication gadgets helps students in understanding some difficult physics concepts like force and motion of Newtonian mechanics. Computer power points could be used by the teacher to demonstrate the motion of a free falling body acting upon by the force of gravity. As they see they learn better. The use of internet provides the best alternative platform for sharing of ideas and knowledge during teaching learning process. To this effect many evidences have shown that learners learn more effectively when they are engaged in using internet. For example Watson (1993) investigated the impact of internet use on pupils' achievements in science and provided evidence that pupils spent longer time on learning, changes in pupils' attitude and motivation for learning have also been discovered. Also Crook (1991) in a review of a range of internet use in science curriculum showed that students using internet took greater responsibilities of their own teaching when they are engaged in using internet.

ii. **Promotes Interactive Learning of Physics**

   The use of ICT facilities can promote interactive learning of physics where both the teachers and the students can explore the teacher ideas and receive feedback within the short-possible time. Internet allows increased and intensive interaction among learners thereby developing their research and study skills (Owolabi and Dansu, 2006).

   Interactive and collaborative teaching and learning of physics help both the teacher and students to have new ideas, knowledge and practice physics by doing and this can virtually help in refining their understanding and receive feedback during the teaching and learning process.

iii. **Promotes Problem Solving Abilities**

   The use of ICT facilities can help students to develop problem solving abilities. For example, if a physics teacher is engaged in the guided discovery method of teaching, he can provide the students with the general principle on any concepts in physics, then the students on their own part will find the solution to the problem themselves. During the process of finding the solution to the problems by the students, the skills of problem solving is acquired through the use of ICT facilities.

iv. **Promotes Innovative Thinking**

   The use of ICT facilities by the physics teachers and students could help in developing innovative thinking. As the student and the teacher are engaged in searching for information on the internet, they are likely to come across the innovations of the great scientists and physics alike. Through the simultaneous use of audio, text, multicolor images, graphics, motion, ICT gives ample and exceptional opportunities to the students to develop capacities to increase their ability to innovate (Aduwa-Ogiegbaen and Iyamu, 2005).

v. **Promotes Communication**

   The traditional mode of communication of face to face between the teacher and the students can be wiped out with the use of ICT facilities. For example if both physics teachers and the students are ICT compliant, the teacher can, send in assignments to the individual students via the internet. The students as well can communicate the solutions to the problem back to the teacher via the same channel. According to Ogunleye (2004), word processing is important for teachers as it can be used to write reports, prepare homework for students, report the findings of their investigation, keeping records such as lesson plans, teaching notes and programme of study.

vi. **Promotes Conservation/Retention of Ideas**

   The use of ICT gadgets by the students will help in the conservation or retention of ideas. When students are allowed to source for the solutions of their problems via the internet, the ideas or knowledge obtained could be conserved or retained since participatory learning is involved.

**Challenges**

Several factors are hampering the successful use of ICT in Nigerian secondary schools. These include:

i. **Inadequate Power and Energy Supply**

   The way electricity is distributed and supplied in this country is not encouraging. There is no part of
Nigeria today that experience 24 hours regular electricity supply. It is pertinent to note that ICT facilities require constant electricity supply for their smooth operations. There is no technological subject that can be offered any where and at any level without regular electricity supply (Aderounmu, 2006). Physics is one of the subjects that require a steady electricity supply in teaching and learning.

ii. **Lack of Trained Manpower**

Another dwindling problem facing the successful use of ICT in Nigerian secondary schools is lack of skill manpower to handle the ICT facilities. According to Aduwa-Ogiegbaen and lyamu (2006), Nigeria does not only lack information infrastructure, she also lacks the human skills and knowledge to fully integrate ICT into secondary education.

iii. **Lack of Accessibility of ICT Facilities**

Another lingering problem is non-accessibility of ICT facilities by both students and their teachers. Even the higher institutions like universities, colleges of education are affected by this problem. Very few universities, colleges of education and polytechnics are well connected to the internet let alone secondary schools. In Nigeria there are few internet providers that provide internet to Nigerians, such internet providers are made up of Nigerians who in partnership with foreign information and communication companies (Aduwa-Ogiegbaen and lyamu, 2005). The rate at which the internet service providers in Nigeria are charging per hour for browsing is too high and this has made their users mainly students to lack access to the internet.

iv. **Cost of ICT Facilities**

The prices of ICT facilities like computer hardware, software and internet service are still so exorbitant in Nigeria when compared with the developed nations like U.S.A, Japan, Germany and so on. This cost problem has made most of our schools left-unconnected. Ogiegbaen and lyamu (2005) said that the prices of hardware and software continues to drop in most developed countries, but in developing countries, such as Nigeria, the cost of computer is several times more expensive.

**Way Forward**

In order to ensure the integration of ICT's in Nigerian schools, the following strategies could be used.

1. State and federal governments should establish electricity generating plants that will provide constant electricity supply in both urban and semi-urban and rural schools.

2. Government at all levels in collaboration with the foreign companies should initiate all secondary schools internet networking programme (ASSINP). This will go a long way in bringing ICT to the door steps of Nigerian secondary school students.

3. Governments in collaboration with non-governmental organisation (NGO's) should put heads together to train science teachers on how to use, operate and repair ICT facilities. When teachers are able to do these, then the integration of ICT in Nigerian secondary schools will not be a problem.

4. To reduce the cost of computer hardware, software and internet connectivity in the country, government at all levels should liaise with foreign companies to reduce the price of the commodity at source before importation.

5. In order for teachers and students to have access to ICT facilities, government and non-governmental organisations (NGO's) should buy enough functional ICT facilities and distribute to schools or they buy and sell to individuals at affordable prices.

**Conclusion**

In this paper, the concept of ICT, relevance of integration of ICT to the teaching and learning of physics, the philosophy and objectives of physics curriculum, the challenges and the way forward were discussed. It has been observed that the integration of ICT into (SSS) physics curriculum will aid students understanding of physics concepts, promote interactive learning of physics, innovative thinking, communication between teachers and students and conservation or retention of ideas amongst students.

Going by the issues discussed in this paper, it has become necessary for the Nigerian government to look into the issues raised with keen interest in order to salvage the educational system of this country from total decay.

**References**


