
INTEGRATING INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) INTO SCIENCE EDUCATION PROGRAM IN NIGERIA PROSPECTS, CONSTRAINTS AND REMEDIES

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Abstract

Globally, the impact of Information and Communication Technology (ICT) in the past decades has been enormous. ICT plays a crucial role in socio-economic development and in bringing the world together as a global village. ICT is relatively a new development in Nigerian educational system. It has been found to play a significant role in science education. However, the adoption of ICT and its integration in teaching and learning has met challenges. This paper discussed the constraints to and prospects of integrating ICT into Science Education in Nigeria. The findings, through descriptive research, revealed that science teachers in Nigeria are not using ICT facilities as an integral part of their science teaching/learning process due to some challenges which include high prices of ICT facilities, lack of infrastructure such as electricity supply, inadequate funding of internet connectivity and lukewarm attitude of many science teachers to be computer literate among others. This paper proffered possible ways of improving ICT integration in science education in Nigeria. It concluded that the importance of ICT integration in science education to improve the quality of science teaching and learning process in schools cannot be over-emphasized. Therefore, science teachers should see ICT as an indispensable part of science education.

Introduction

Ability to work with information and communication technologies (ICT) is recognized as one of the key competencies necessary for success in life. In the past two decades, there has been a growing understanding of the important role of ICT, not only in business and economics, but also in teaching and learning. As educational technologies and new learning methods evolve, teachers are expected to

adopt and assimilate rich and exciting teaching strategies. According to Aneke and Ochuba (2010), in the present society, knowledge, ideas and techniques grow and change so rapidly. Such knowledge explosion and changes constitute serious challenges to science education because most science teachers hardly give enough information to satisfy the learning needs of learners. For that, the incorporation of ICT to facilitate effective teaching and learning

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The place of Science Education in the development of any nation cannot be over emphasized. Science is the pivot of life and we live in a society that is influenced by science and technology in all its ramifications. These can be exemplified in the areas of use of drugs in medicine, pharmacy, varied food supplies and other chemical products for personal and

corporate comfort. Science plays a major role in the economic growth and income per capita of every nation and it has been observed that the pride of any nation depends on its scientific and technological advancement (Onyishi, 2007). Although, it is true that some teacher education programs particularly in the Universities and Colleges of Education have partially introduced some aspects of Information and Communication Technology, many are still not ready for its adoption and utilizations.

Nigeria has not properly harnessed the potentials of ICT especially in the education sector. With this concept in mind, it becomes pertinent to consider the constraints to and prospects of integrating ICT into science education in Nigeria.

The Current Status of ICT in Nigeria Education

Today, in most developed countries, nearly every aspect of human life, including education, is ICT-driven. The education sector in Nigeria still lags behind in this aspect of technology. However, concerted efforts are being channelled towards this direction by the Teachers Registration Council of Nigeria (TRCN), National Commission for Colleges of Education (NCCE) and the National Universities Commission (NUC) (Aturamu, 2006).

In Nigeria, it is pertinent to state that ICT studies have been introduced into the school curriculum at all levels of education

teaching these students and pupils are not skilled in ICT education and application. This calls for the urgent need to address the present situation as teachers constitute a major influence on the use of ICT in the teaching and learning process, especially in science education.

Roles of Science Teachers in ICT Integration

Many teachers still use traditional methods to teach science. These traditional methods are teacher-centred against the innovative methods which are student-centred. Umeasiegbu and Esomonu (2012) observed that chalkboard and textbooks have continued to dominate classroom activities in most schools and institutions in Nigeria. Admittedly, the understanding of science education has increased dramatically in recent times than so many decades ago. What should be uppermost in the minds of present day science teachers is ICT compliance. Using information and communication technology devices such as computers, CD-Rom, TV, Digital camera, internet etc, can indeed improve teaching and learning of science. Through ICT, learning experiences are being brought to the doorsteps of teachers and learners. According to Uwa and Agbanusi (2005) and Umeasiegbu (2007), some of the available information and communication technology tools that can be integrated in the teaching/learning in science education, include; Systematized feedback or video feedback, computer based operation network, computer discs with read-only-memory (ROM),

camcorders and digital cameras, video conferencing, etc.

From the foregoing, the science teachers will have the following important roles to play;

Teachers should act as ICT facilitators. The teachers should assist the students in making use of the ICT facilities. The teacher can also assist the students to be able to link local issues to international happenings and develop global attitudes to scientific knowledge with ICT. The teacher is expected to allow the students access to the ICT facilities but should be guiding them as a facilitator;

They should present materials in such a way that will enable the students to develop critical thinking, verify facts, seek for evidence and ask higher order questions with ICT;

Teachers should create conditions that will make learners see relationships between subjects, courses and discipline while teaching them with ICT.

It should be noted that teachers that are ill-prepared or are not ICT literate may find it difficult to use information and communication technology (ICT) in science education. This is one of the major challenges facing the integration of ICT into science education programmes in Nigerian secondary schools.

Methods of Integrating ICT into Science Education

Science teachers need to know that ICT has the potential to make significant

but it is yet to be matched with required practical exposure to the utilization of these new skills for optimal productivity. Much of the intervention has been in the areas of providing some measure of literacy in the aspect of computer word processing. It is quite obvious that in spite of the presumed exposure to ICT education as a general studies course in Nigerian universities, more than 80% of Nigerian undergraduates and graduates are unable to adequately utilize the computer and more than 90% (by conservative estimate of the Nigerian secondary school students) are unable to use computer, while at the primary school level, less than 5% of the total population is computer literate (Adako & Aturamu, 2006). The reason for this is not far-fetched. The teachers teaching these students and pupils are not skilled in ICT education and application. This calls for the urgent need to address the present situation as teachers constitute a major influence on the use of ICT in the teaching and learning process, especially in science education.

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handling of students' examinations, results and records. The teacher can use the Computer to prepare the students' records, examinations and results. By sitting in the comfort of their homes, the teachers can make the data available to the students and the school authorities through the internet. When the science teacher incorporates all these methods in science teaching and learning, it will enable the students to, ask questions, predict and hypothesise, observe, measure, record and manipulate variables, interpret their results and evaluate scientific evidence and present /communicate their findings in a variety of ways using the ICT. In other words, ICT enhances science students' acquisition of science process skills as outlined above.

Constraints to integration of ICT into Science Education Programme in Nigeria

The challenges militating against the effective use of ICT in teaching science in Nigeria are of multifarious dimensions. As rightly observed by Ojo (2005) the crop of teachers who are expected to bring reform into Nigerian education system went through the traditional 'old' system without any exposure to ICT. It becomes a difficult problem for this set of teachers to acquire adequate mastery of skills and contents that are embedded in ICT. The fact that many teachers lack the basic skills and

access to ICT facilities have impeded their ability to integrate the ICT in their teaching and learning programmes.

Haruna (2005) observed that the initiation and development of information and communication technology service in Nigeria is constrained by certain human and material factors. Some of these are highlighted as follows:

1. Students may lack knowledge about learning from ICT packages. This implies that some initial teaching may be necessary on ICT packages as students may have no ideas what the packages offer in terms of allowing them to structure the knowledge in their own way. Equally worrisome is the fact that science teaching and use of ICT has not assumed serious dimensions in many Nigerian schools and colleges.
2. ICT facilities are expensive and unaffordable to many individuals, private and government schools. The program requires a lot of money and time to be implemented because to purchase the computers, link them to the internet and manage them is capital intensive.
3. Necessary infrastructures such as electricity and telephone for the operation of ICT components are lacking. Power supply is a major problem in this country and these ICT facilities require constant power supply which is not always available. The effort of the government to achieve

such a way that will enable the students to develop critical thinking, verify facts, seek for evidence and ask higher order questions with ICT;

Teachers should create conditions that will make learners see relationships between subjects, courses and discipline while teaching them with ICT.

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Methods of Integrating ICT into Science Education

Science teachers need to know that ICT has the potential to make significant contribution to their students' knowledge, understanding and skills. These can be achieved, when the teachers incorporate the following ICT gadgets and methods into their science classroom delivery:

1. Simulations and Modelling: Simulations and modelling is used to help students understand phenomena which may be too slow, too fast, too dangerous or too expensive to investigate in the school science laboratory, and to allow them to investigate the effects of changing variables in the situations represented or to consolidate and reinforce conceptual understanding;

2. Data Logging: This is a method of using sensors to record variables such as temperature, moisture, light and pressure.

This is to assist in the recording, presentation and analysis of results, so that students can spend more time on interpretation, evaluation and formulation of hypotheses about the implications;

3 Databases and Spreadsheets:

This is used to enable students to organise, search and sort information in order to explore relationships, look for patterns and test hypotheses. e.g. extracting data on the nutrient value of different types of food;

4 Publishing and Presentation Software:

This will include the use of word processing and desktop publishing packages and multimedia authoring software, to enable students to develop understanding and present their findings to others. In using the power-point, the teacher have to prepare the lessons and present it to the students using the power-point package of the computer and multimedia projector. Some abstract concepts such as the splitting of the atom, electricity, meiosis and mitosis of cells etc. can be projected using the multimedia which ordinarily the students would not have been able to see;

5. Information Resources: This involves the use of the Internet, Videoconferencing, educational broadcasting, CD-ROM and data files. This is to enable students find information and thus, develop their knowledge and understanding of science concepts. The internet is a global system of interconnected computer networks that interchange data by packet-switching using the standard internet protocol. Here,

3. Supportive infrastructures such as electricity and telecommunication services should be improved for effective services. A comprehensive energy policy is needed in the country. The policy should include a national energy audit that takes into account energy conservation as well as the exploitation of renewable energy resources like solar and wind.
4. ICT facilities should be made available at affordable prices to be procured by science teachers at government subsidized rates.
5. ICT centres should be established at strategic places to provide services to people especially the science teachers and students. While there are clarion calls on the government to get connected to the internet, non-governmental organizations should be encouraged to assist in connecting the schools to the internet (Adako, 2006).
6. Re-orientation and re-direction of value system towards the latest development around the world will put science teachers in a state of readiness to whole heartedly embrace the ICT technology. This could be achieved through teacher in-service training programmes such as conferences, seminars and workshops that are based on ICT and science teaching/learning processes in schools.

Prospects of ICT in Science Education in Nigeria

The pace of development of ICT in every facet of human life is quite appreciable. In as much as ICT has been

found to be an indispensable tool in various facets of human society, education too has adopted ICT in various ways since it has been found to be of useful support in teaching and learning processes. Science teachers as nation builders, cannot afford to be left behind in the revolutionary approach to modern day knowledge. It becomes highly imperative for the science education planners to be concerned with evolving effective strategies for teaching in various schools.

ICT possesses a great potential for science education and capacity building. It allows for systematic gathering, processing and dissemination of information through the use of creative tools for managing and delivering subject matter. Oliver, Chapman & French (1992) in Owolabi, Oyewole and Oke (2013) opined that a science teacher could benefit from the dynamism of ICT to demonstrate some difficult concepts, theories and principles, thereby giving meaning to classroom science instruction and making class presentation an exciting one.

Science teachers can use ICT to simplify science teaching, make learning experiences more effective and offer students access to a variety of learning tools, expert opinions and alternative view points. It affords science teachers and students the opportunity to appreciate positively their cardinal tasks of teaching/learning and research activities.

ICT has been a veritable tool that can be used to enhance quality of science education in such ways as increasing learner motivation and engagement, facilitating the acquisition of basic skills

the students are exposed to the internet to browse and learn scientific concepts. The video conferencing is a means of conducting conference between two or more participants separated by space, by using computer networks to transmit audio and video data. This can also enable the science students to participate in this form of conference if such facilities are present in their schools. In educational broadcasting, science education programs in the form of lessons or practical activities are pre-recorded by the teacher and played to the science students in the radio and television. Here, the students can also record the lessons or lectures for future use.

6. Handling of Students' Exam Scores and Records: ICT is useful in handling of students' examinations, results and records. The teacher can use the Computer to prepare the students' records, examinations and results. By sitting in the comfort of their homes, the teachers can make the data available to the students and the school authorities through the internet. When the science teacher incorporates all these methods in science teaching and learning, it will enable the students to, ask questions, predict and hypothesise, observe, measure, record and manipulate variables, interpret their results and evaluate scientific evidence and present /communicate their findings in a variety of

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