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Utilization of Information and Communication Technology (ICT) for Teaching and Learning of Science and Technical Subjects in Senior Science and Technical Colleges for Sustainable Economic Development in North-Eastern Geo-political Zone of Nigeria

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ABSTRACT
Information and Communication Technology (ICT) has become a force that has changed many aspects of the way we live and every aspect of human endeavor such as education, medicine, business, law and engineering. Education is a socially oriented activity and quality education has traditionally been associated with teachers having high degrees of personal and face-to-face contact with students. But with the world moving rapidly into digital media and information, the role of ICT in education is becoming more and more important. However, indicators on technology uptake and use in education in the secondary schools in Nigeria are missing and most of the schools continues to use the traditional method for knowledge dissemination. This study assess the adoption and use of ICT in teaching and learning in Senior Science and technical Colleges in North-eastern Zone of Nigeria. The findings of the study revealed that inadequate provision of Information and Communication Technology facilities for effective teaching of science, Majority of Science and Technical teachers in this school are not computer literate, lack of interest among teachers to adopt the use of modern Information and Communication Technology facilities for teaching of Science and Technical , lack of Information and Communication Technology technicians to repair broke down existing ICT facilities for teaching Science and Technical , lack of constant supply of electricity affects the use of Information and Communication Technology facilities for teaching Science and Technical , lack of constant supply of electricity affects the use of Information and Communication Technology facilities for teaching Science and Technical , fear in using ICT facilities for their teaching of Science and Technical teachers, Inadequate funding for procurement and management of Information and Communication Technology facilities for teaching Science and Technical and lack of spare parts of most of the Information and Communication Technology facilities required for teaching of Science and Technical are some of the problems faced by science and technical teachers in teaching senior secondary schools students in the north-eastern states of Nigeria.
Keywords: Information and Communication Technology, Computers, Teaching, Learning, Schools

INTRODUCTION

The introduction of Information and Communication Technology and Science and Technical teaching in secondary schools and its implementation in many countries across the world came about as a result of

policy pronouncement and the need to cope with the trend of science and technology (Pearson 2000, Crawford 2000, Kirkman 2000; Mizukoshi, Kim & Lee 2001). Generally, computers do not only play a significant role in the society, but increasingly schools are acquiring computers as an aid to facilitate learning (Guile, 1998). In a similar way, in order for learning to be effective within schools, Computer literacy has to be integrated into the curriculum (Richards & Nason, 1999).

This means that computers should not only be utilized as a tool for acquiring skills, but should also be used as a tutor. Taylor (1980) writes that learners use computers in the tutor mode by responding to preset programmes that were programmed by specialists in the field. Good examples of this include word processors and spreadsheets (Heukelman, 1994). To be able to utilize computers in the tutee mode means that the learner should be able to instruct the computer. New instructional techniques that use Computer provide a different modality of instruments for the student, Computer use allows for increased individualization of learning. In schools where new technologies are used, students have access to tools that adjust to their attention span and provide valuable and immediate feedback for literacy enhancement. Implementation of Computer studies across the globe has been slow despite the demands for information communication technology (ICT) know how. In advanced countries like the United States of America (USA) they are more advanced in Computer and yet in high schools there is a decline in offering Computer studies (Orsborne & Hennesy, 2003) despite its critical and growing importance, Science and Technical is taught in only a small minority of U.S. schools (Langmia, 2012). African countries still experience a lag in its implementation, and that continues to widen the digital and knowledge divides. A study, by Kiptalam & Rodrigues, (2010), observed that access to Computer facilities is a major challenge facing most African countries, with a ratio of one Computer to 150 students against the ratio of 1:15 students in the developed countries. Enuku & Enuku (2000), states that there is undoubtedly an interest in Computer Studies (CS) at the secondary level, but actual teaching of this content is another story. There is little evidence supporting the notion that Science and Technical courses, let alone Computer training is uncommon in Nigerian primary or secondary schools (Jegede & Owolabi, 2003). In the similar way Williams (2003) adds that such courses and degrees are offered at the university level, but to reach that point of Computer literacy takes extra self-motivation and that Computer is still not fully implemented in Nigerian school system as it should.

Computer has a long history of existence. Today Computer technology has undergone series of transformations. According to Kremer (2005) defines Computer as electronic machine that operate with remarkable speed and reliability. Although initially, many believe it was impossible that Computer could be a scientific field of study, in the late fifties it gradually became accepted among the greater academic population. Science and Technical which is the science that deals with the theory and method of processing information in digits. Computer has become a rapidly growing discipline as the technological age advances.

Science and Technical could also be understood as the blending of principles, theories and applications of technologies that underlies the access of information. The information that the Computer scientist uncovers, processes, stores and communicate is often encoded in a Computer memory. From the above explanations, it could be deduced that Science and Technical is wholly referring to the science of computing which is the use of Computer to process data or perform calculations. Computers have virtually touched nearly every aspect of human endeavor. Computer is an electronic device which accepts data as an input process, stores and gives out information as output.

It is a machine which can hold vast qualities of information and accurately stores information for future use. Kremer (2008) defined Computer as electronic machine that operate with remarkable speed and reliability. A micro processor “brain” and electronic memory work together to enable the Computer process data. Why was the Computer invented should be the next question that comes to mind. Computers were invented to solve many Science and Technical problems in the early stage. But today, computers have gone beyond that and there is hardly any area of life where Computer cannot be applied. In a rapidly changing world, basic education is essential for an individual to be able to access and apply information. Such ability must include the adequate use of computer. The Economic Commission for

Africa has indicated that the ability to use Computer in accessing information is no longer a luxury, but a necessity for development. Unfortunately, many developing countries especially in Africa, are still low in Computer application and use (Aduwa, 2005).

Evoh (2007) emphasized that secondary school or secondary education is essential of the creation of effective human capital in any country. The need for the conclusion of Science and Technical in the education curriculum of the Nigerian secondary schools cannot be overemphasized. In this technology-driven age, every one requires Computer competence to survive (Adom & Anie 2006). This calls for early acquisition of Computer skills by students. Oduroye (2002) emphasized the increase in demand for Computer literacy in Nigeria. This is because; employees realize that Computer and other Computer facilities can enhance efficiency, on the other hand, employees have also realized that computers can be a threat to their jobs, and the only way to enhance job security is to become Computer literacy. Teaching and learning these skills is a concern among professionals. Computer application and use will prove beneficial in improving Nigeria's educational system and giving students a better education, also, skilled Computer professionals who will be well equipped to solve computer problems in Nigeria and other parts of the world (Goshit, 2006).

There are development in the Nigeria education sector, which indicates some level of Computer application in the secondary schools. The federal Government of Nigeria in the national policy on Education (Federal Republic of Nigeria, 2004) recognize the prominent role of computers in the morden world, and has integrated Computer studies and science into education in Nigeria. To actualize this goal, the document states that government will provide basic infrastructure and training of the primary school. At the junior secondary schools. It is also the intention of government to provide necessary infrastructure and training for the integration of Science and Technical in the secondary schools system.

It should be noted that 2004 was not the first attempt the Nigerian government made to introduce Computer education in schools. In 1988, the Nigerian government education enacted a policy on Computer education. The plan was to establish pilot schools and diffuse Science and Technical innovation first to all secondary schools, and then to primary schools. Unfortunately, the project did not really takeoff beyond the distribution and installation of personal computers (Okebukola, 2007). Aduwa and Iyamu (2005), concluded that the Computer is not part of classroom technology in more than 90 percent of Nigeria public schools.

There are numerous problems that hinder the effective teaching of Science and Technical in secondary schools among other are Inadequate Provision of Facilities Ajavero (1998) noted that absence of facilities in acquisition of knowledge creates problems and confusion to the learner instead of making changes in the learners' life. Ezekiel (2001) added that Science and Technical laboratory is a room where hardware and software are programmed, practical zed, ordered, grouped, recorded, rearranged, constructed among many other activities but the question is how facilitated is the room that could be boast the acquisition of Computer for without facilities, the acquisition of Computer is not effective.

On lack of Trained Personnel Abiodum (2007), revealed that hence Computer is "garbage in garbage out" There is need that Science and Technical teachers are well trained otherwise they will cabbage wrong thing into the children, and the children will as well garbage out the Wrong thing. Francisca (2003), said that many of the laudable curriculum we have in use are poorly implements due to poor training and orientation of key implementers (teachers) of these curricula. The teachers through constant workshop and seminars should be well equipped in the relevant methodologies and knowledge that are appropriate for effective teaching of computer.

On financial constraint Ukeje (2001), stressed on the need for the government to finance educational section, Computer education needs more financial support more than other subjects in the school; if Science and Technical subject is not supported financially it totally impedes its acquisitions. On organizational constraints Computer knowledge are acquired in the Computer training centers and not in school which attracts less attention to the periods allocated for its lesson in the school. In schools Science and Technical is not included in the school time table that is why Jude (2007), maintained that Computer

education is still limited in the federal colleges. This implies that the chalkboard and textbook continue to dominate classroom activities in most Nigerian secondary schools.

Statement of the Problem

Despite the importance of Computer in our education system and nation in general, many factors however has hindered the growth and adoption of Science and Technical in Nigeria secondary schools. Such factors range from lack of interest in Computer studies in the part of the students to lack of dedication in the part of the teachers. The task we have today in a developing country like ours (Nigeria) is to find a way of tackling the present factors that hinder the teaching of science and technology.

Purpose of the Study

The main purpose of the study Utilization of Information and Communication Technology (ICT) for Teaching and Learning of Science and Technical Subjects in Senior Science and Technical Colleges for Sustainable Economic Development in North-Easthern Geo-political Zone of Nigeria was to assess the present state of ICT utilization and the challenges faced by science and technical school teachers in the study area. Specifically, the study sought to:-

1. Determine the problems faced by science teachers in teaching and learning of science and technical students in senior secondary schools in North-eastern states of Nigeria.
2. Find out the possible solutions to the problems faced by science teachers in teaching science subject in senior secondary schools in North-eastern states of Nigeria.

Research Questions

The following research questions guides the study,

1. What are the problems faced by Science and Technical teachers in teaching science in senior secondary schools in North- eastern states of Nigeria?

2. What are the possible solutions to the problems faced by Science and Technical teachers in teaching Science and Technical in senior secondary schools in North- eastern states of Nigeria?

Significance of the Study

The findings of this study will help Science and Technical teachers to develop and adopt strategies which will help in solving those problems that are obstacle to their teaching of science and improve on their work for better results. The study will help to identify the problem encountered by teachers in the use of Computer for science instruction which will be beneficial to the three tiers of government when these problems are identified they will be channeled to all those concerned with ministry of education principals of schools and other stake holders in education, so as to find solution to the identified problems. This would enable the teacher of science course in secondary school to approach or apply the new technology (computer) potentials as a ready tool to change pedagogical outcome.

More so, the finding will enable the policy makers to budget adequate fund for the purchase of facilities for the use of Computer for science instruction in secondary schools. This will also help them see the need for the employment adequate number of will qualified Computer literate science teachers in secondary schools. Also policy makers will use the findings to review the existing policies especially on teacher training on Computer skills with a view of guiding them on using computers as a medium of teaching and learning. The findings will also assist in formulation of policy guidelines on using computers as a medium of teaching and learning in all secondary schools of not only Science and Technical but other subjects as well.

To educational administrators are charged with the responsibility of monitoring learning programmes in schools. The findings will help them to ensure appropriate and meaningful Computer instructions in Science and Technical and other subjects as used in secondary schools. The results will also help the Government to identify and plan administrative issues related to imports, marketing and access to computers and Computer software in order to enable students' access quality education.

Finally, the findings of this study will also serve as reference materials for further researchers in similar topic under investigation.

Scope of the Study

The study is limited to Science and technical college teachers in North-eastern states of Nigeria. 12 science and technical colleges were selected within the geo-political zone. It may also along the line try to find out some possible solutions to those problems. The study also did not cover the entire North-east but a representative schools within the zone. This is due to insecurity situation across the states, limited time for research work and limited resources at researcher disposal.

RESEARCH METHODS

Research Design

The design of this study is survey type of research design. A survey research design according to Nworgu (1991) is one in which a group of people or items is studied by collecting and analyzing data from only a few people or items considered to be representative of the entire group. This design was considered appropriate and suitable for this study because it focused on obtaining information and analyzing data from a group of science secondary schools teachers considered to be representative of the entire population.

Sample and Sampling Techniques

The population of this study was comprises of twelve (12) Science and Technical schools North-eastern States of Nigeria. Simple random sampling was used to select 12 schools from the study area. (Adamawa, Bauchi, Borno, Gombe, Taraba, and Yobe)

Research Instrument

Structured questionnaire was the instrument for data collection. The researcher design the questionnaire titled "Utilization of Information and Communication Technology (ICT) for Teaching and Learning of Science and Technical Subjects in Senior Science and Technical Colleges for Sustainable Economic Development in North-Easthern Geo-political Zone of Nigeria" for the respondents to respond to either, Strongly Agreed (SA), Agreed (A), Disagreed (D), and strongly disagreed (SD) respectively.

Validation of Research Instrument

The instrument to be used in collecting data for this study was validated by three lecturers one from School of Science Education, Department of Science and Technical Education and two from School of Education, Federal College of Education (Technical) Potiskum, Yobe State. The corrections and suggestions made on the instrument were affected before the final copy of the instrument is produced.

Method of Data Collection

The researcher administered the questionnaire to the selected Science and Technical teachers in Secondary Schools in North-eastern States of Nigeria After responding to the questionnaires the researcher collected back the filled questionnaire on-the-spot.

Method of Data Analysis

The data collected for this study was analyzed using mean and standard deviation statistical tools. A 4 points linkers' type rating scale was used with assigned values of 4, 3, 2 and 1 respectively for:

Strongly Agreed	-	4 points
Agreed	-	3 points
Disagreed	-	2 points
Strongly Disagreed	-	1 point

The mean was determined with the following formula:

$\bar{X} = \frac{\sum FX}{N}$ Where,

$\bar{X}$= mean

F = frequency

X = nominal value of option

$\sum$ = summation sign

N = number of the respondent

A cut- off point of 2.50 was used to determine the mean which was obtained thus:

$$\frac{4+3+2+1}{4} = \frac{10}{4} = 2.50$$

This mean that any mean score equal to or greater than (≥) 2.50 was considered as agreed response and any mean score less than (<) 2.50 was considered as disagreed responses.

PRESENTATION OF RESULTS

The data collected for this study were presented in tabular form based on each stated research question with their corresponding interpretation.

Research Question: 1: *What are the problems faced by science teachers in teaching science and technical in senior secondary schools in North-eastern states of Nigeria?*

Table 1: Shows the Mean and Standard Deviation on the problems faced by Science and Technical teachers in teaching science and technical in senior secondary schools in the study area.

1.	There is inadequate provision of Information and Communication Technology facilities such as computer for effective teaching Science and Technical .	5	2	4	1	2.58	1.44	Agreed
2.	Majority of Science and Technical teachers in this school are not computer literate.	4	3	2	3	2.66	1.23	Agreed
3.	There is lack of motivation to teachers to adopt the use of modern Information and Communication Technology facilities for teaching of Science and Technical .	6	1	1	4	2.75	1.42	Agreed
4.	There is no/few of Information and Communication Technology technicians to repair broke down existing ICT facilities for teaching Science and Technical .	7	1	2	2	3.08	1.24	Agreed
5.	Lack of constant supply of electricity affects the use of Information and Communication Technology facilities for teaching Science and Technical .	3	3	5	1	2.66	0.98	Agreed
6.	Science and Technical teachers fear to use ICT facilities in teaching Science and Technical .	5	4	1	2	3.00	1.12	Agreed
7.	There is inadequate funding for procurement and management of Information and Communication Technology facilities for teaching Science and Technical .	4	3	2	3	2.66	1.23	Agreed
8.	Most spare parts of Information and Communication Technology facilities required for teaching of Science and Technical are not readily available	3	6	1	2	2.83	1.02	Agreed

In table 2 above, the study revealed that the respondents agreed with the statements that inadequate provision of Information and Communication Technology facilities for effective teaching Science and Technical , Majority of Science and Technical teachers in this school are not computer literate, lack of interest among teachers to adopt the use of modern Information and Communication Technology facilities for teaching of Science and Technical , lack of Information and Communication Technology technicians to repair broke down existing ICT facilities for teaching Science and Technical , lack of constant supply of electricity affects the use of Information and Communication Technology facilities for teaching

Science and Technical , lack of constant supply of electricity affects the use of Information and Communication Technology facilities for teaching Science and Technical , fear in using ICT facilities for their teaching of Science and Technical teachers, Inadequate funding for procurement and management of Information and Communication Technology facilities for teaching Science and Technical and lack of spare parts of most of the Information and Communication Technology facilities required for teaching of Science and Technical are some of the problems faced by Science and Technical teachers in teaching.

Research Question: 2 *What are the possible solutions to the problems faced by Science and Technical teachers in teaching Science and Technical in senior secondary schools in North*-eastern *states of Nigeria?.*

Table 2: Shows the Mean and Standard Deviation on the possible solutions to the problems faced by Science and Technical teachers in teaching Science and Technical in senior secondary schools North-eastern states of Nigeria.

1.	Provision of adequate Information and Communication Technology facilities for teaching Science and Technical.	6	3	1	2	3.08	1.16	Agreed
2.	Training and retraining of Science and Technical teachers on the use of modern Information and Communication Technology facilities for teaching Science and Technical.	7	3	1	1	3.33	0.98	Agreed
3.	Science and Technical teachers should be motivated to adapt to the use of modern Information and Communication Technology facilities for teaching of Science and Technical.	1	9	1	1	2.83	0.71	Agreed
4.	Provision of adequate Information and Communication Technology technicians to repair broke down existing ICT facilities for teaching Science and Technical.	8	2	-	2	3.33	1.15	Agreed
5.	Alternative to supply light of solar power can enhance effective utilization of ICT facilities.	3	4	4	1	2.75	0.96	Agreed
6.	Pre-disposing both teachers and students to the use ICT facilities will reduce aversion toward utilization of ICT facilities.	6	5	1	-	3.41	0.66	Agreed
7.	Provision of adequate funding for procurement and management of existing Information and Communication Technology facilities for teaching Science and Technical.	7	2	1	2	3.16	1.19	Agreed
8.	Provision of spare parts of ICT facilities required for effective teaching and learning of Science and Technical.							

In table 2 above, the study revealed that the respondents agreed with all of the statements that provision of adequate Information and Communication Technology facilities for teaching Science and Technical , Training and retraining of Science and Technical teachers on the use of modern Information and Communication Technology facilities, motivation of Science and Technical teachers to adapt to the use of modern Information and Communication Technology facilities, provision of adequate Information and Communication Technology technicians to repair broke down existing ICT facilities, Alternative to supply light of solar power can enhance effective utilization of ICT facilities, Pre-disposing both teachers and students to the use ICT facilities will reduce aversion toward utilization of ICT facilities, provision of

adequate funding for procurement and management of existing Information and Communication Technology facilities, and provision of spare parts of ICT facilities required for effective teaching and learning of Science and Technical are some of the possible solutions to the problems faced by Science and Technical teachers in teaching Science and Technical in senior secondary schools in North-eastern States of Nigeria.

Summary of Findings

The findings of the study revealed that inadequate provision of Information and Communication Technology facilities for effective teaching Science and Technical , Majority of Science and Technical teachers in this school are not computer literate, lack of interest among teachers to adopt the use of modern Information and Communication Technology facilities for teaching of Science and Technical , lack of Information and Communication Technology technicians to repair broke down existing ICT facilities for teaching Science and Technical , lack of constant supply of electricity affects the use of Information and Communication Technology facilities for teaching Science and Technical , lack of constant supply of electricity affects the use of Information and Communication Technology facilities for teaching Science and Technical , fear in using ICT facilities for their teaching of Science and Technical teachers, Inadequate funding for procurement and management of Information and Communication Technology facilities for teaching Science and Technical and lack of spare parts of most of the Information and Communication Technology facilities required for teaching of Science and Technical are some of the problems faced by Science and Technical teachers in teaching Science and Technical in senior secondary schools in North-eastern States of Nigeria

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DISCUSSION OF FINDINGS

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CONCLUSION

The use of computer such as ICT conferencing have made it possible to overcomes barriers of space and time, and opens new possibilities for effective teaching and learning in our secondary schools. The use of such technology is increasing, and it is now possible to deliver training and teaching to a widely disperse audience by means of on-demand two-way video over terrestrial broadband networks. There is now an increasing awareness regarding the potentials of computer in teaching and learning. Many senior secondary schools in the study area are now infusing ICT into their teaching activities. The race has become rather dramatic because the students seem to be leading the teachers in e-capabilities. The computers and Internet facilities in the homes of the affluent students complemented by the cybercafé proliferating the entire country have provided hundreds of thousands of Nigerian secondary school students an unprecedented opportunity to join millions of their colleagues around the globe to surf and navigate.

It can be concluded from this study that, integration and proper use computer and other ICT gadgets in the teaching of science and technology in secondary schools in the north east will go a long way in raising the fallen standard of education, making learning real and more interesting, no longer abstract. This also will motivate Science and Technical learners/students', who deserve an improved approach to their daily educational pursuit via the use of modern educational technologies. The need to equip Science and Technical teachers with adequate ICT skills and infrastructure also becomes imperative in the modern world of technology today.

RECOMMENDATIONS

Based on the results and findings of the study, the following recommendations were made, as these recommendations would go a long way to solve the problems of effective use of computers in teaching in senior secondary schools in the state.

1. Employers of teachers and teachers themselves should take advantage of the several on-going in-service training on ICT by participating with enthusiasm and partnering with organizers to expand the tenure of such training or workshops. It won't be out of place however, if the ministries of education and local government education authorities provide computers, Internet and other ICT infrastructure in all the government own schools so as to encourage teachers to use them.
2. Teacher training and professional development oriented policies should support ICT-related teaching models that encourage both students and teachers to play an active role in teaching/learning activities.
3. Emphasis must be placed on the pedagogy behind the use of ICTs for teaching/learning. Teachers need to adopt, develop and support a pedagogic culture that develops supportive practices for students' and encourages own theories in teaching/learning activities. It should be linked to the development of life-long learning and professional practices that enable teachers to keep in touch with ICT developments, new knowledge and research on teaching/learning.

4. Science and Technical teachers in senior secondary schools in the state should be exposed to ICT use in instructional development through seminars and workshops sponsored by the state government.
5. Government should concentrate the ICT policies in the senior secondary schools in the State.
6. Government and relevant agencies should establish policy for provision of ICT.
7. Government through ministry of education should provide a way for observing the required ICT facilities that will fill the gap and imbalance in the education system.

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