AVAILABILITY AND UTILIZATION OF INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) IN THE TEACHING AND LEARNING OF CHEMISTRY IN SECONDARY SCHOOLS

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Abstract

Chemistry is one of the core science subjects taught in all the senior secondary schools in Nigeria and it is assumed to be abstract in nature. It is the responsibility of the Chemistry teachers to make the subject concrete and real to the students by using a variety of teaching methods. Therefore, vibrant and resourceful Chemistry teachers have lots of work to do in finding out new methods of teaching Chemistry. Information Communication Technology (ICT) has the potential to solve real life issues in classrooms in a way that was not possible before in a traditional classroom setting. The flexible nature of ICT and the internet especially provide students with the opportunities for research, interaction, collaboration and cooperation. The study examined the availability of Information Communication Technology in the teaching and learning of Chemistry in some selected secondary schools in Oyo West Local Government of Oyo State. A descriptive design method was adopted. 40 teachers were selected using a simple random sampling technique. Simple Percentage was used to analyze the data collected. The findings of this research revealed that most ICT resources required are not available at all. It was recommended among others that there should be continuous training and ICT skills upgrading for teachers, also. There should be continuous and consistent monitoring and evaluation of government policy on ICT and Government and stakeholders should also provide funds for procurement and maintenance of ICT in schools.

Introduction

The development of interactive technologies and other free web-based applications allow teachers nowadays to present various types of lessons. With the development of information technologies, computers have shown themselves as the most powerful tools to develop students' ability to query and to support the teaching of science (Ngwu, 2014). In science education, computerized modeling and animations are used for describing, explaining and predicting scientific processes. These transitions may promote higher order thinking and explanation abilities which are fundamental for the learning of science (Ugwu, 2006).

Information Communication Technology (ICT) can be said to be the range of technologies of information that are used in the process of collecting, storing, editing, retrieving and transfer of information in various forms (Kptalam and Rodgrignes, 2011). ICT can also be referred to as that which encompasses all equipment or tools (include of traditional technologies of radio, video and television to the name technologies of computer hardware etc.) as well as the methods, practices, process, procedures, concept and principles that come into play in the conduct of information and communication activities (Federal Ministry of Education, 2019).

Also, (NTI, 2011) simply defined ICT as a means of receiving, processing, storing, retrieving and dissemination of information through the use of computer and other telecommunication facilities. ICT gadgets and facilities as such as radio, television,

micro projector, compact discs, satellite, e mail, internet, overhead projector, video machines, computers, camera etc. According to (Saddiq and Salim, 2017) ICT facilities also include telephone, global system for mobile communication (GSM) facsimile (fax) and telex machines. Other additional facilities are electron bulletin board, teleconferencing, teleprocessing, data base, internet optical fiber, white board etc.

Information and Communication Technology have become key tools and have revolution impact on how we see the world and how we live. Information and Communication Technology refers to all those electronic devices that are used in broadcasting telecommunications and all other electronically related information communication system. Some of these devices include laptop, palmtop and computers. Information Communication Technology (ICT) has great potentials and applications in science educations in particularly and all aspect of life in general. According to Bandelm (2016), ICT is a revolution that involves the use of computers, internet and other telecommunication technology in every aspect of human endeavour. Furthermore (Ofodu, 2014) defines ICT as electronic or computerized devices, assisted by human and interactive materials that can be used for a wide range of teaching and learning as well as for personal use.

(ICT) has the potential to solve real life issues in classrooms in a way that was not possible before in a traditional classroom setting. The flexible nature of ICT and the internet especially provide students with the opportunities for research, interaction, collaboration and cooperation (Cole, 2000).

Chemistry is one of the core subject taught in all senior secondary schools in Nigeria and it is assumed to be abstract in nature. It is the responsibility of the chemistry teachers to make the subject concrete and real to the student by using a variety of teaching methods, (Saddiq and Salim, 2017). Hence, vibrant and resourceful chemistry teachers have lots of works to do in finding out new method of teaching chemistry. ICT based education if properly utilized can be made interactive and this can provide activity based teaching method in which students can actively participate thereby providing experiences that would sink deeper into the students memories than listening to verbal teaching. Method of teaching has gone beyond traditional method and this makes the integration of information technologies very important in science class. Information technology has broken the monopoly, and provided varieties in teaching-learning situation in chemistry. This means that information technology should be properly rooted in the senior secondary school curriculum so that the level of literacy would be increase with regard to the use of information technology in teaching chemistry.

The use of information and communication technology in teaching and learning has brought into the system, new and emerging technologies that come to challenge the traditional methods involved in the teaching and learning processes. While contributing to the importance of ICT Igboegwu, Egolum and Nnoli (2011) points out that ICT have imparted on quality and quantity of teaching and learning and research education and provide opportunity for students and teachers to communicate with one another more effectively. Brekke and Hogstad (2010) opined that those preparing to become teachers must incorporate technology into the class and that the use of ICT in schools is to increase the effectiveness of teaching and learning.

Some of the obvious importance of integrating ICT into the teaching and learning of Chemistry in secondary schools are that it increases the scope, knowledge and interaction of Chemistry teachers, thereby making the task of the teachers simpler. It also helps chemistry teachers to

gain access to current chemistry resources and standards. ICT eliminates the requirement for handling large classrooms and laboratories and also improves chemistry teacher' effectiveness by exposing the teachers to knowledge beyond his/her immediate.

Furthermore, speaking on the benefit of ICT, the Federal Government of Nigeria (2013:27) on its national policy on education stipulated: That "in recognition of the prominent role of information technology (IT) in advancing knowledge and skills necessary for effective functioning in a knowledge driven world, government shall provide adequate infrastructure and develop capacity for effective utilization of Information Technology (IT) to enhance the delivery of basic education in Nigeria.

This paper therefore aims at examining the availability and utilization of ICT in the teaching and learning of Chemistry in Oyo West Local Government of Oyo State.

Statement of the Problem

Chemistry which is one of the core science subjects have been regarded as difficult by so many students, this is due to its abstract nature. Therefore, there is a need for the Chemistry teachers to make the subject concrete and real to the students by using a variety of teaching methods and also to find a way in which Chemistry lessons can be disseminated in such a way that the students will understand. This study therefore examines the utilization and availability of ICT resources in schools. Hence, Information Communication Technology, (ICT) has the potential to solve real life issues in classrooms in a way that was not possible before in a traditional classroom setting.

Objective of the Study

The main objective of this study is to evaluate the availability and utilization of Information Communication Technology in the teaching and learning of Chemistry in some selected secondary schools in Oyo West Local Government of Oyo State.

Research Questions

To guide the study, the following research questions were formulated:

i. To what extent are ICT resources available in senior secondary schools?
ii. To what extent are ICT resources used in senior secondary schools?
iii. What are the problems of using ICT resources in senior secondary schools?
iv. What are the solutions to the identified problems?

Methodology

The research design adopted for the study was a descriptive survey. A well constructed and self-developed questionnaire was used to access information from the Chemistry teachers. The questionnaire was validated by the experts in the field of Chemistry education. The questionnaire is made up of two sections. Section A, focused on the personal data of each respondent while Section B elicited information on the extent of availability of ICT in the teaching and learning of Chemistry. The questionnaire utilized a 4-point scale of highly available, moderately available, slightly available and not available. Ten schools were randomly selected from the secondary schools in Oyo West Local Government. The instruments were administered personally by the researcher and two research assistants. A total of 40 copies of questionnaire were distributed and all (100%) were retrieved. The face and content validities of the instrument were ascertained. Four (4) respondents were selected from each school making a total of forty respondents. The data were analyzed using simple percentage.

Results

Analysis of Results

Research Question 1:

Table 1: Availability of ICT Resources For Teaching and Learning of Chemistry

S/N	ICT Resources	Highly Available (%)	Moderately Available (%)	Slightly Available (%)	Not Available (%)	Grand Total (%)
1	Basic computer software (word processing, spread sheet, power point are available in my school)	4 (10.00)	6 (15.00)	2 (5.00)	30 (75.00)	40 (100%)
2	Multimedia projector	1 (2.5)	2 (5.00)	2 (5.00)	35 (87.50)	40 (100%)
3	Internet facilities	0 (0.00)	0 (0.00)	0 (0.00)	40 (100)	40 (100%)
4	Television / Video / Flat Screen	1 (2.5)	2 (5.00)	1 (2.5)	37 (92.50)	40 (100%)
5	Ready made for programmer for Chemistry instruction	0 (0.00)	0 (0.00)	0 (0.00)	40 (100)	40 (100%)
6	CD-ROMs	3 (7.50)	0 (0.00)	2 (5.00)	35 (87.50)	40 (100%)
7	Electronic bulletin board	0 (0.00)	0 (0.00)	3 (7.50)	37 (92.50)	40 (100%)
8	Computer desktop	0 (0.00)	0 (0.00)	0 (0.00)	40 (100)	40 (100%)
9	Computer laptop	0 (0.00)	0 (0.00)	0 (0.00)	40 (100)	40 (100%)
10	Power supply	2 (5.00)	1 (2.50)	3 (7.50)	29 (75.00)	40 (100%)

Table 1 displays the respondents' responses on the availability of ICT resources for teaching and learning of Chemistry. On the statement that basic computer software such as word processing, spread sheet, power point, 4 (10.00%) respondents agreed that they were highly available, 6 (15.00%) respondents agreed that they were moderately available, 2(5.00%) respondents agreed that resources were slightly available while 30 (75.00%) pointed that they are not available. On the availability of multimedia projector in the schools, 35 (87. 50%) pointed they were not available, 2 (5.00 %) respondents agreed they were slightly available, 2 (5.00%) agreed they were moderately available while 1(2.5%) respondents strongly agreed that they were highly available. More so, it was found that all 40 (100%) respondents strongly disagreed that internet facilities were not available, electronic bulletin board, CD-ROMs, computer desktop and that computer laptop size are not available in the schools under study. It was equally found that power supply were not in most schools to facilitate uses of ICT facilities as 29 (75%) respondents concurred.

Research Question 2

Table 2: Uses of ICT resources in teaching and learning of Chemistry

S/N	Items	SA (%)	A (%)	D (%)	SD (%)	Grand Total (%)
1	Basic computer software such as word processing, spreadsheet, power point enhance good lesson presentation	1 (2.5)	1 (2.5)	2 (5.00)	36 (90.00)	40 (100%)
2	Multimedia projectors boost effective instructions	3 (7.5)	0 (0.00)	0 (0.00)	37 (92.50)	40 (100%)
3	I have access to internet facilities which allow planning of Chemistry class instructions	1 (2.5)	2 (5.00)	1(2.5)	36 (90.00)	40 (100%)
4	I do make use of diskette contain lessons prepared for PowerPoint presentation	0 (0.00)	0 (0.00)	0(0.00)	40 (100.00)	40 (100%)
5	I'm use to readymade programme for Chemistry instructions	1 (2.5)	0 (0.00)	1 (2.5)	38 (95.50)	40 (100%)
6	CD-ROMs for drilling of students in practical activities are in use	0 (0.00)	2 (5.00)	2 (5.00)	36 (90.00)	40 (100%)
7	I do use electronic bulletin board for highlights key points	0 (0.00)	0 (0.00)	0 (0.00)	40 (100.00)	40 (100%)
8	Computer desk-top for students independent learning	1 (2.5)	2 (5.00)	1 (2.5)	37 (92.50)	40 (100%)
9	I have personal computer laptop size for teacher use during instruction	0 (0.00)	0 (0.00)	0 (0.00)	40 (100.00)	40 (100%)
10	I do use computer in processing student results.	1 (2.5)	0 (0.00)	1(2.5)	38 (95.50)	40 (100%)

Table 2 displays the uses of ICT resources in teaching and learning of Chemistry. On the statement that basic computer software such as word processing, spreadsheet, power point, in lesson presentation, 1 (2.5%) respondents strongly agreed, 1 (2.5%) respondents agreed, 2(5.00%) respondents disagree while 36 (90.00) respondents strongly disagreed. In addition, 37 (92.50%) respondents strongly disagreed while 3 (7.5%) respondents strongly agreed that multimedia projectors in varying instructions and presentation. Majority of the respondents strongly disagreed that they did not have access to computer in processing student results, 38 respondents (95.50%), readymade programme for Chemistry instructions 38 respondents (95.5%) CD-ROMs for drilling of students in practical activities, 37 respondents (92.50%). All the respondents 40 (100%) strongly disagreed that they use laptop size for their preparation during instruction, that there is electronic bulletin board for highlights key points and that they make use of diskette contain lessons prepared for Power Point presentation.

Research Question 3

Table 3: Problem of Using ICT in Teaching and Learning of Chemistry

S/N	Item	SA (%)	A (%)	D (%)	SD (%)
1	Inadequate funding is one of the problem of using ICT	35 (87.50)	2 (5.00)	3 (7.50)	0 (0.00)
2	Majority of Chemistry teachers are not computer literate	20 (50.00)	10 (25.00)	8 (20.00)	2 (5.00)
3	High level of corruption and insecurity is another challenge of ICT usage	32 (80.00)	6 (15.00)	2 (5.00)	0 (0.00)
4	Power supply is not readily available for the uses of equipment like projectors and internet facilities	37 (92.5)	2 (5.00)	1 (2.5)	0 (0.00)
5	Chemistry involves practical thus, the use of ICT in teaching and learning of Chemistry is difficult	30 (75.00)	7 (17.5)	2 (5.00)	1 (2.5)

Table 3 displays problems of using ICT in teaching and learning of Chemistry. 35 (87.50%) respondents strongly agreed that inadequate funding is one of the problem of using ICT, 2 (5.00%) respondents agreed, 3 (7.50%) respondents disagreed with the view. Also, 20 (50.00%) respondents submitted that majority of Chemistry teachers are not computer literate, 10 (25.00%) respondents agreed, 8 (20.00%) disagreed while 2 (5.00%) strongly disagreed. In addition to this, 32 (80.00%) strongly agreed, 6 (15.00%) agreed while 2(5.00%) disagreed that high level of corruption and insecurity is another challenge of ICT usage. That power supply is not readily available for the uses of equipment like projectors and internet facilities was voted by the majority respondents' i.e. 37 (92.5%) respondents, 2(5.00%) respondents agreed while 1(2.5%) respondents disagreed. 30 (75.00%) respondents strongly agreed, 7(17.5%) respondents agreed while 1(2.5%) pointed that Chemistry involves practical thus, the use of ICT in teaching and learning of Chemistry is difficult.

Research Question 4

Table 4: Solution to Problems of Using ICT Resources for Teaching and Learning of Chemistry

S/N	Item	SA (%)	A (%)	D (%)	SD (%)
1	Government at various levels should ensure adequate provision of ICT gadgets in schools	40 (100.00)	0 (0.00)	0 (0.00)	0 (0.00)
2	Enough supportive staff who should ensure proper maintenance and functionality of ICT gadgets should be employed	37 (92.5)	2 (5.00)	1 (2.50)	0 (0.00)
3	Non-governmental organization (NGO) such as Parents Teachers Association (PTA) should join hand with government to equip the school with IT facilities	30 (75.00)	5 (12.00)	2 (5.00)	3 (7.50)
4	Chemistry teachers should be more committed to their teaching job by utilizing the available ICT facilities	40 (100.00)	0 (0.00)	0 (0.00)	0 (0.00)
5	Massive training should be organized to make Chemistry teachers effective in the use of ICT facilities	40 (100.00)	0 (0.00)	0 (0.00)	0 (0.00)

Table 4 shows some solution to problems of using ICT resources for teaching and learning of Chemistry. All the respondents, 40 (100.00%) strongly agreed that on the statement that government at various levels should ensure adequate provision of ICT gadgets in senior Secondary schools enough supportive staff who should ensure proper maintenance and functionality of ICT gadgets should be employed, Chemistry teachers should be more committed to their teaching job by utilizing the available ICT facilities and that massive training should be organized to make Chemistry teachers effective in the use of ICT facilities. In addition, 37 (92.5) strongly agreed that enough supportive staff who should ensure proper maintenance and functionality of ICT gadgets should be employed, 2 (5.00%) agreed while 1 (2.50%) disagreed. 30 (75.00) respondents strongly agreed that Non-governmental organization (NGO) such as Parents Teachers Association (PTA) should join hand with government to equip the schools with ICT facilities, 5 (12.00) agreed, 2 (5.00) disagreed while 3 (7.50) strongly disagreed.

Discussion of Findings

From research question 1, the respondents responses on the availability of ICT resources for teaching and learning of Chemistry, majority agreed that basic computer software such as word processing, spread sheet, power point, multimedia projector in the schools, internet facilities, electronic bulletin board, CD-ROMs, computer desktop and that computer laptop size are not available in the schools under study. It was equally found that power generation were not in most schools to facilitate uses of ICT facilities as respondents concurred.

Table 2 displays the uses of ICT resources in teaching and learning of Chemistry. However, the respondents concluded that they did not have access to basic computer software such as word processing, spreadsheet and power point in lesson presentation, multimedia projectors in varying instructions and presentation, access

to computer in processing student results, readymade programme for Chemistry instructions. Also, CD-ROMs for drilling of students in practical activities, that there is electronic bulletin board for highlights key points and that they make use of diskette contain lessons prepared for PowerPoint presentation.

Table 3 displays problems of using ICT in teaching and learning of Chemistry. Among the problems identified were inadequate funding, majority of Chemistry teachers are not computer literate, high level of corruption and insecurity is another challenge of ICT usage. Also, poor power supply is not readily available for the uses of equipment like projectors and internet facilities, Chemistry involves practical, thus the use of ICT in teaching and learning of Chemistry is difficult

Table 4 shows some solution to problems of using ICT resources for teaching and learning of Chemistry. Government at various levels should ensure adequate provision of ICT gadgets in senior Secondary school. Enough supportive staff who should ensure proper maintenance and functionality of ICT gadgets should be employed, Chemistry teachers should be more committed to their teaching job by utilizing the available ICT facilities and that massive training should be organized to make Chemistry teachers effective in the use of ICT facilities. In addition, enough supportive staff who should ensure proper maintenance and functionality of ICT gadgets should be employed, and non-governmental organization (NGO) such as Parents Teachers Association (PTA) should join hand with government to equip the schools with ICT facilities.

Conclusion

This study focused on the availability and utilization of ICT in the teaching and learning of Chemistry, the extent of utilization of the available resources, the availability of these ICT resources, the problems encountered in the utilization of ICT and the possible solutions. The research revealed that most ICT resources required are not available at all. Problems hindering the utilization of these resources were highlighted and possible solutions were proffered. Based on these findings, it can be concluded that ICT resources are not available in most of the secondary schools.

Recommendations

Following the findings of this research, it is recommended that:

1. There should be continuous training on ICT.
2. There should be continuous and consistent monitoring and evaluation of government policy on ICT in secondary schools.
3. Government and stakeholders should provide funds for procurement and maintenance of ICT in Secondary Schools.

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