THE AVAILABILITY AND UTILIZATION OF SOME SELECTED INFORMATION TECHNOLOGY FACILITIES AMONG SENIOR SECONDARY SCHOOL CHEMISTRY TEACHERS IN KOGI STATE

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Abstract: The study appraised the availability and utilization of the information technology (IT) gadgets/facilities among the senior secondary school teachers in Kogi State. A survey design was used for the study and the sample consisted of one hundred and eighty-four (184) chemistry teachers drawn from one hundred and five (105) senior secondary schools in Kogi State. Data was collected using teacher's questionnaire tagged availability and utilization of information technology gadgets for teaching chemistry (AUITGTC). Frequencies and Simple percentages were used to analyse the research questions, while hypothesis was tested with t – test at 0.05 alpha level. The result showed that IT gadgets/facilities are not available in most of the Senior Secondary Schools and that most chemistry teachers do not utilize even the few available IT gadgets/facilities in teaching. It was also found that there was no significant difference between male and female chemistry teachers in their level of utilization of IT gadgets/facilities. Based on the low availability and utilization of the IT gadgets/facilities in the schools, recommendations were made that, government and non – governmental organisations should make efforts to furnish the senior secondary schools with IT gadgets/facilities and chemistry teachers should utilize them in teaching chemistry among others.

Keywords— Essay test, Predictors, Achievement, Geography, Objective test, Corrrelation, Examination.

Introduction

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. Vibrant and resourceful chemistry teachers have lots of work to do in finding out new methods of teaching chemistry. Nwosu (2003) has argued that ICT based education, if properly utilized, can be made interactive and this can provide activity based teaching methods in which students can actively participate thereby providing experiences that would sink deeper into the students memories than listening to verbal teaching. Adeyemo (2010) has further argued that method of teaching has gone beyond traditional methods 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 will be increased with regard to the use of information technology in teaching chemistry.

Betiku (2003) citing Aburine (2002) defined Information Technology as any equipment or technique used by people to handle information". While Adeyegbe and Ayo (2003) citing Hassan (2001) defined information technology as a broad based technology that supports the creation, storage and manipulation of information Betiku (2003) has argued that sometimes, it is called Information and Communication Technology (ICT) as the activities of information technology involve communication (ie the process of sending and receiving message). 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. From the above definitions, information and communication technology (ICT) can be defined as the application of computer and other telecommunication gadgets to store, retrieve, transmit and manipulate data in any human endeavour. Adeyegbe and Ayo (2003) identified the ICT gadgets and facilities as radio, television, compact discs, satellites, e-mail, internet, overhead projector, micro projector, video machines, computers, camera, etc. Achimugu (2015) expatiating on this list, included telephone, global system for mobile communication (GSM), facsimile (fax) and telex machine. Contributing to this, Ugwu, (2006) identified the following additional facilities: electronic bulletin Board, teleconferencing, teleprocessing, database, internet optical fibre, white board, etc.

The researcher shall briefly explain the meaning and some uses of the selected IT gadgets/facilities for teaching chemistry.

1. ***Radio:*** This is wireless electronic device that transmits audio signals from radio station and are picked up by any radio bands such as frequency modulation (FM), short wave (SW) and amplitude modulation (am) bands. Radio can be used to teach chemistry by placing it in the special listening classrooms. The students and teachers can reach the presenter through phoning (i.e. GSM or telephone) and ask presenter questions for better understanding of the topics. Students can also listen to chemistry debates and quizzes on radio programmes.
2. ***Tape Recorder:*** This is a modern machine that records the voices of people. There are many models of radio cassette recorders that are now available. They can be used in various ways in teaching chemistry. They can be used for playing a pre-recorded cassette for instance, during a field trip, they can also record radio broadcast. For instance on quizzes which can be used for the students – teachers interaction.
3. ***Television:*** This is an audio visual medium and popular electronic mass media of instruction. Television can be used in teaching chemistry by watching television programmes like quizzes, puzzles, games, debates, etc, in relation to chemistry as a subject. The programmes could be video – taped and played back to the students at their convenient time which would allow students-teacher interaction or the students can reach the presenter live by using GSM during a telephone phoning programme.
4. ***Video Machine:*** This is a type of machine that is used to project motion picture and the pictures are fashioned for continuous projection at a particular speed. There are different types such as video tape machine, digital video discs (DVD), video compact discs (VCD), etc. It can be recorded in tape or disks. Video is a good IT facility that can be used for teaching chemistry. For instance, one can use slim video tools which contains video lecture, video –

simulation, interactive simulation, task review, etc to effectively teach chemistry.

5. ***Digital Camera:*** This is also used to capture picture and it can be used to teach chemistry most especially during chemistry educational tours such as field trip. Pictures snapped during a field trip or excursion can be reported back to other students who were unable to attend the field trip or excursion.
6. ***Projector:*** This is a device that allows images to be focused on the screen. It can be overhead projector, micro projector, film projector, etc. A chemistry teacher can prepare his or her own slide on different topics or can buy commercially prepared slides and systematically use the slides in teaching the students using any of the available projectors.
7. ***Telephone:*** This is a telecommunication device that is used to send and receive audio (sound) signals across distances. Telephones can be used to ask presenters questions for better understanding of chemistry concepts during a television or radio programmes.
8. ***Global System for mobile communication (GSM):*** This is a modern portable telephone that connects to a cellular based station used for personal communication over short or long distance. Apart from the traditional role of sending and receiving calls, it has advantages over telephone as it provides other services such as text messages (SMS), E-mail, internet facilities and SMS facility for sending and receiving photos and videos. It can be used to teach chemistry in many ways. For instance, information assessed on GSM, internet facilities can serve as already made lesson notes that can be directly used to teach students or later presented to the students in modified and more interesting way.
9. ***Computer:*** This is a modern machine that can be programmed to automatically perform various operations. Information can be created, stored and transmitted through the computer. Computer can be put to use in various ways in teaching and learning chemistry. For instance, information accessed through browsing such as lesson notes, data, diagrams, images, animation, etc could be saved in personal computer or copied to flash drive or CD and this could later be used in teaching chemistry for better understanding of the students.
10. ***Internet:*** This is a global collection of computers linked to each other, sharing available resources and communicating effectively. Internet connectivity provides audio and video information which facilitates chemistry classroom lessons. For instance, chemistry class teaching, individualized instruction, etc can be downloaded through internet browsing, which can be printed out or saved on computer or copied to CD for later usage in presenting a given topic in an interesting way to the students.
11. ***E – Mail Address:*** Also known as electronic mail is a means of carrying out a computer based communication in which an electronic letter is sent to one or more recipients via the help of the internet. This also can be used in teaching chemistry in different ways. For instance, through social network and online charts, chemistry teachers can reach and interact with their students in teaching which can help to remove the abstractness of some concepts.
12. ***World Wide Web (www):*** This is a medium that allow people to get information which is available on the internet. Examples are www.yahoo.com, www.googl.com, etc. Lesson notes can be downloaded from web sites and used in teaching chemistry effectively. Example of such sites is http//www.teachnet.com
13. ***Satellite:*** This is a complex device located in space that orbits the earth. It carries information transmission or signal from one part of the earth to another. It can directly be used to teach students chemistry by viewing interactive instruction software or it can be copied in CD or flash drive and used in teaching later. A large amount of chemistry education information can be assessed and distributed over large distance at cheep cost.
14. ***Electronic bulletin Board:*** This is an electronic board. Both chemistry teachers and students can use the board to obtain up-to-date information, publish lectures and exchange academic ideas with the rest of the world.

The use of information and communication technology in teaching and learning has brought into the system, new and emerging technologies that have 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) point out that ICT have impacted on quality and quantity of teaching, learning and research education and provides opportunity for students and teachers to communicate with one another more effectively. Brekke and Hogstad (2010) opine 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 Secondary Schools includes the following:

- ICT increases the scope, knowledge and interaction of chemistry teachers, thereby making the task of the teacher simpler.
- ICT helps chemistry teachers to gain access to current chemistry resources and standards.
- ICT eliminates the requirements for handling large classrooms and laboratories.
- ICT improves chemistry teacher's effectiveness by exposing the teachers to knowledge beyond his/her immediate environment.
- ICT helps students to learn chemistry with ease and to retain what they taught for a long period of time.
- ICT improves chemistry students to participate in classroom activities
- ICT enables chemistry students exchange ideas with their chemistry teachers in and outside the classrooms.
- ICT promotes individualized learning in chemistry

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".*

The major issue of academic concern at this juncture, is whether the aims and objectives of the provision and utilization of IT gadgets/facilities in teaching and learning chemistry are being achieved? Answering this question constitute the focus of this paper.

Problems of the Study

The pertinent question at this point is how much of the ICT gadgets/facilities are available in the senior secondary schools in Kogi State? How much of the available materials are used in the secondary schools by chemistry teachers? These questions present problems that necessitated this study.

Purpose of the study

The purpose of this study is to appraise the level of availability and utilization of some selected information technology gadgets/facilities among the senior secondary school teachers in Kogi State.

Specifically, the study is to determine

1. The level of availability of the information technology gadgets and facilities.
2. The level of utilization of the available information technology gadgets and facilities.
3. The influence of sex in the utilization of the available information technology gadgets and facilities.

Research Questions

In order to address the objectives of this study, the following research questions are used:

1. What is the level of availability of information technology gadgets and facilities for teaching chemistry in senior secondary schools?
2. To what extent do chemistry teachers utilize the available information technology gadgets and facilities, in teaching chemistry?

Hypothesis

One null hypothesis was tested at significance level of 0.05.

Ho: There is no significant difference between male and female chemistry teachers on their level of utilization of information technology gadgets/facilities.

Methodology

Research design

A survey research design was used for the study.

Population of the study

The target population were four hundred and forty-eight (448) chemistry teachers in the two hundred and sixty-two (262) public senior secondary schools of the twenty-one (21) local government areas of Kogi State as at 2015.

Sample and Sampling Technique

Stratified random sampling technique was used to choose one hundred and five (105) schools, five (5) from each of the twenty-one (21) local government areas of Kogi State. All the one hundred and eight-four (184) chemistry teachers in the one hundred and five (105) sampled senior secondary schools formed the sample or subjects of the study.

Instrument for data collection

The instrument used for the study was a questionnaire prepared by the researcher. The questionnaire was tagged *Availability and Utilization of Information Technology Gadgets for Teaching Chemistry (AUITGTC)*. The instrument contain three sections (A – C). Section A is bio-data seeking information such as sex, school location, qualification, rank and age. Section B dealt with information on availability of information technology gadgets/facilities and the respondents were to tick if these facilities where available or not: Section C was designed to find out the extent of the use of the available IT gadgets/facilities by chemistry teachers in senior secondary school on four points Likert type scale of very often, often, rarely and never. The instrument was validated by giving it to five experts, two from measurement and evaluation and three from science education. Their opinions and comments led to the emergence of the final instrument used for the study. The questionnaire was administered to 30 chemistry teachers in Enugu State who were not part of the study. Measure of internal consistency was determined using Cronbach Alpha and the value was 0.82. This was considered high enough for the study.

Table 1: *Availability of IT gadgets and facilities for teaching chemistry in Senior Secondary Schools.*

S/N	*It Gadgets Facilities*	*Available*		*Non Available*	
		Freq	*%*	*Freq*	*%*
1	Radio	38	21	146	79
2	Tape recorder	40	22	144	78
3	Television	48	26	136	74
4	Video tape machine	18	10	166	90
5	Digital video Discs (DVD)	33	18	151	82
6	Telephone	16	9	168	91
7	Global System for mobile communication (GSM)	166	90	18	10
8	Digital Camera	61	33	123	67
9	Electronic bulletin Board	22	12	162	88
10	Micro Projector	25	14	159	86
11	Overhead Projector	16	9	168	91
12	Satellite	60	33	124	67
13	Computer	106	58	78	42
14	Internet	46	25	138	75
15	E – mail	84	46	100	54
16	World Wide Web	23	12	161	88

Table 1 above shows that most of the IT gadgets and facilities are not available in the majority of the schools. For instance, 75% of the chemistry teachers responded that there was no Internet service available at all in their schools. This implies that majority of the schools are not connected to Internet networking. Similarly, 88% of chemistry teachers indicated that their schools do not have Web Site (www). In the same vein, 67%, 79%, 74%, 84%, 88% 86% 78% and 91% of the schools do not have satellite dishes, radio, television, DVD electronic bulletin board, micro projector and overhead projector respectively, etc. 58% of computer and 90% of GSM are available in the sampled schools.

Table 2: Extent of use of available ICT gadgets/facilities in teaching of chemistry at the senior secondary schools.

S/N	*It Facilities*	*Number Available*	*Very often*		*Often*		*Rarely*		Never	
			F	*%*	*F*	*%*	*F*	*%*	F	%
1	Radio	38	0	0	3	8	7	18	28	74
2	Tape recorder	40	4	10	4	10	6	15	26	65
3	Television	48	3	6	6	13	9	19	30	63
4	Video tape machine	18	0	0	0	0	6	33	12	67
5	Digital Video Discs (DVD)	33	2	6	6	18	9	27	16	49
6	Telephone	16	0	0	0	0	4	25	12	75
7	GSM	166	12	7	26	16	40	24	78	47
8	Digital Camera	61	6	08	12	18	15	20	28	56
9	Electronic bulletin Board	22	0	0	5	23	7	32	10	46
10	Micro Projector	25	0	0	3	12	6	24	16	64
11	Overhead Projector	16	0	0	1	6	3	19	12	75
12	Satellite	60	5	8	10	17	11	18	34	57
13	Computer	106	11	10	22	21	30	28	43	41
14	Internet	46	5	11	7	15	10	22	24	52
15	E – mail	84	2	2	6	7	20	24	56	67
16	World Wide Web (www)	23	2	9	3	13	5	22	13	57

Table 2 reveals that most of the available IT gadgets /facilities are not being utilized by the chemistry teachers. For instance, 69% of the chemistry teachers never or rarely used computer in teaching chemistry. Similarly, 71% of the teachers never or rarely used GSM in teaching chemistry. This implies that computer and GSM were not used even though they were available. In the same vein, 52%, 67% and 57% of chemistry teachers never utilized Internet services, E – mail and www respectively in teaching chemistry. The trend is almost same for other IT gadgets/facilities as seen in table 2.

Method of Data Collection

The questionnaire was administered by the researcher and research assistants who were active members of Science Teacher Association of Nigeria (STAN), Kogi State branch other than chemistry teachers. The choice of action STAN members as research assistants is to facilitate data collection. They were asked to administer and collect back questionnaire items during their visit on the spot. With this emphasized, all the questionnaires were returned thus ensuring 100% return rate.

Method of Data Analysis

Data collected were analysed using frequency counts and simple percentages to answer research questions while t – test statistical tool was used to test the hypothesis at 0.05 level of significance.

Result

The results of this study were presented based on the research questions and hypothesis formulated as follows:

Hypothesis

There is no statistically significance difference between male and female chemistry teachers in their mean scores on their utilization of ICT gadgets/facilities.

Table 3: T – test for male and female chemistry teachers on their extent of utilization of ICT gadgets/facilities.

	N	X	SD	Df	F. Cal	T-Table
Male	98	3.26	1.42			
Female	86	3.35	1.36	96	0.65	1.96

From the table, the calculated value of t at 0.05 level of significance with 96 degree of freedom in 0.65. This value is less than the table value 1.93. Thus the null hypothesis is accepted. That is, there is no significant difference between male and female chemistry

teachers in their level of utilization of ICT gadgets and facilities. Although the female seems to out-perform their male counterparts yet the difference was found to be statistically insignificant.

Discussion

The study appraised the availability and utilization of IT gadgets / facilities in teaching and learning chemistry among the senior secondary school teachers in Kogi Sate. The result obtained reveals that majority of the IT gadgets /facilities for teaching in the secondary schools are not available and the few available ones are under-utilized by the teachers.

The findings from table 1 that majority of IT gadgets/facilities are not available in most of the schools is in conformity with the findings of Olangunji (2003), Ugwu (2006), Ahmed, Abimbola, Omosewo and Akanbi (2012) and Okoye and Onwuachia (2012). It is also in line with the finding of Betiku (2003) who points out that telephone, satellite, E – mail, Internet and www are not available in the schools in reasonable numbers. Another interesting finding from table 1 is that GSM and computers are found in most schools. This may be as a result of chemistry teachers having personal GSM and laptop computers.

The finding from table 2 shows that the few available IT gadgets/facilities are underutilized, is in agreement with the findings of Onasanya, Shehu, Ogunlade and Adefuye (2011); and Ndirika and Kanu (2012) who separately reported that the extent of science teachers' utilization of ICT infrastructure is low in Oyo and Abia States respectively. Also, this work collaborates with the findings of Igboegwu, Egolum and Nnoli (2011) who found out, that most senior secondary school chemistry teachers in Anambra State were not using ICT facilities for their teaching and learning chemistry. Also the finding from table 2 indicates that GSM and computers were seldomly used, even though they are available in the schools.

The results from tables 1 and 2, implies that despite the sensitization given on the vital role of ICT in enhancing, the teaching and learning of chemistry, most of the secondary schools do not have the ICT facilities and that the chemistry teachers do not properly utilize them in teaching chemistry. This has a great implication to the success of ICT policy statement as contained in the national policy of education (2007: 27). "*Government should provide adequate infrastructure and develop capacity for effective utilization of ICT to enhance education delivery in Nigeria*". Indeed the finding of this study contradicts the tenets of the policy document and therefore has placed the success of the policy document in jeopardy. Therefore the provision of adequate ICT facilities and the proper utilization by chemistry teachers in teaching and learning chemistry is very important.

The finding from table 3 indicates that there is no significant difference between male and female chemistry teachers in their level of utilization of IT gadgets/facilities. The findings is in line with the findings of Iboegwu,Egolum and Nnoli (2011) and Ololube (2006) who found no significant difference between the mean of male and female teachers toward the utilization of ICT in teaching.

Recommendations

On the basis of the findings of this study, the following recommendations are put forward:

1. Government at various levels should ensure adequate provision of Information Technology (IT) gadgets/facilities in the senior secondary schools and indeed, at the other levels of education as contained in the national policy on education (FGN, 2013)
2. Government should employ enough supportive staff, who should ensure proper maintenance and functionality of the available IT gadgets and facilities.
3. Non-governmental organisation (NGO) such as Parents Teachers Association (PTA), Community Development Associations, etc should join hands with government to equip our schools with information technology facilities.
4. Chemistry teachers should be more committed to their teaching job by utilizing the available IT gadgets/facilities in teaching chemistry.
5. Chemistry teachers should endeavour to attend seminars, conferences and workshops to equip themselves to face global challenges of effectively using information technology gadgets and facilities in teaching and learning chemistry.
6. The teacher education institutions such as faculty of education, institute of education, colleges of education, national teachers institute, etc should ensure that pre-service teachers are properly trained or grounded on the utilization of information technology gadgets/facilities in teaching and learning.

Conclusion

This study has revealed that ICT gadgets/facilities are not available in reasonable number in majority of the schools and that the available ones are not being utilized properly by chemistry teachers, despite the impact of IT infrastructure have in chemistry education. Therefore, it is recommended that government and non-governmental organisations should work very hard to assist to supply information technology gadgets/facilities for effective teaching and learning of chemistry. Massive training should also be organized to make chemistry teachers effective in the use of IT facilities and indeed, chemistry teachers are encouraged to utilize the available IT facilities.

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