Availability and Utilization of Information and Communication Technology in Teaching and Learning of Biology in Secondary Schools

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***Abstract:*- This study examines the availability and utilization of Information and Communication Technology (ICT) in teaching and learning of Biology in secondary schools. The study was guided by three research questions and one hypothesis. The design utilized in this study is the Descriptive survey design. Checklist and Questionnaire were the instruments utilized for data collection. The checklist was used to ascertain the ICT facilities available in public schools. A structured questionnaire titled Availability and utilization of ICT in teaching and learning of Biology was utilized. The reliability coefficient of 0.79 and 0.75 was determined for both teachers and students respectively using Cronbach alpha. Data were analysed using frequency counts, percentages, mean and standard deviation for the research questions, while the Hypothesis was tested using Z-test. The findings of the study revealed that there is a low presence of ICT facilities in public secondary schools. Teachers and students utilized ICT facilities in a low extent in teaching and learning of Biology in senior secondary schools. There is no significant difference in the utilization level of ICT facilities by teachers and students in teaching and learning of Biology. It was recommended that non-Governmental Organisation. Government, Cooperative bodies, multinational cooperation and individual should ensure the provision of functional ICT facilities in both private and public secondary schools; this will improve quality teaching and learning.**

***Keywords:* Availability, utilization, ICT facilities, biology teachers and students.**

I. INTRODUCTION

Information and communication technology (ICT) may be defined as that feature of technology which deals, with the handling and processing of information, utilizing a wide variety of electronic gadgets in facilitating communication and learning.ICT amongst different technologies appears to have changed impressively numerous features of human life than some other scientific innovations. In Nigeria, for example, ICT has changed the business, communication, and information segments. Numerous administration exchanges are presently being done through ICT; it was even reported that the 2011 general elections would have been through electronic voting machine (an ICT) (Vikoo2013). The Federal Republic of Nigeria (2014) declared that ICT is a workmanship and connected sciences that deal with information communication. It encompasses all gear (counting computational apparatus, PCs, equipment, programming, instruments, strategies, practices, forms, methodology, ideas, standards, and the sciences) that become an integral factor in the conduct of information exercises: obtaining, portrayal, handling, introduction, security, trade, exchange, administration, association, stockpiling, recovery, of data information. This subsequently demonstrates ICT is an imperative piece of the contemporary world. ICT can be utilized to improve instructing and learning of Biology. Biology is a discipline that deals with the investigation of living things. Biology is one of the science subjects that is offered in the secondary school level. Igwe (2003) depicted science as a methodical investigation of the idea of the material practices and physical universe through perception, experimentation, estimation and recording.

Teacher perception to engage all students in active learning processes in classroom constitutes a crucial prerequisite for enhancing students' achievement. Teachers perception processes provide important insights into teachers' ability to focus their attention on ICT in the complexity of classroom interaction and distribute their attention across students in order to recognise the relevant needs for learning utilizing ICT. Use of ICT by instructors can improve effective educating. Issues like effective classroom management, self-study, cooperative learning, undertaking focused exercises, and active communication amongst instructors and students exercises can be upgraded by the utilization of ICT. The use of ICT will guarantee students' dynamic and satisfactory involvement in classroom learning. All aspects of the learning modules can be so decidedly impacted and influenced by the utilization of ICT. With the computer, a virtual research center can be created where students perform down to earth practices as though it were, in actuality, circumstance. At the point when ICT is incorporated into Biology lessons, the part of the educator changes from that of a speaker to that of a facilitator of learning and the students move toward becoming adventurers of learning. The utilization of ICT in Biology studies includes models, demonstrating, data logging, information base and spread sheet. This makes the lesson intriguing, propelling, standard for dependability is high in light of the fact that the students were effectively included and, in this manner, making the Biology lesson more successful. Ndioho (2016) in Williams and Avwiri, 2016).

ICT when applied to education boosts the delivery and access to learning and enhances the curriculum. It produces richer learning outcomes compared to education lacking ICT. It encourages critical reasoning and offers boundless ways of attaining educational objectives. The important thing is not in ICT itself however in comprehending ICT and viably utilizing it in the conveyance of knowledge and achieving objectives in short time. Four noteworthy approaches as indicated by the UNESCO-ICT framework; have been distinguished for adequately using ICT in education. They are the Emerging, Applying, Infusing and Transforming methods that institute ICT optimization phases in education. These approaches are simultaneous and rely upon each other for most maximum advantage from ICT application to teaching.

It is observed that the influence of ICT on education is to advance the capacity of every learner to generate access, adopt and apply knowledge and information to tackle complex issues. ICTs are one of the significant contemporary factors in shaping the now worldwide economy and creating rapid changes in the general public. They have essentially changed the way individuals learn, communicate and do business (UNESCO, 2012). Nonetheless, in acknowledgment of the prominent role of ICT in advancing learning and important skills, it is expressed in the national policy on education that for viable functioning, in present day world, there is an urgent need to incorporate ICT into Nigeria Education System. According to NITDA (2013), ICT is having a revolutionary influence on educational methodology worldwide. Regardless, this transformation is not across the board and should be fortified to achieve a substantial level of the populace. Theories used in this study are the Behaviourist and the Constructivist theory. Behaviourist theory believes that individuals can learn more efficiently if their environment is prudently organized. The Constructive theory highlights the significance of learning based on experience. The instructors act as facilitators and the students plays a dynamic character in the learning process. The reasons why these learning theories were used is that they focus on the person. They focused on the significance of the teacher student relationship and the significance of research needing to be a collaborative exercise with practicing instructors.

Aja and Eze (2016) examined the use of ICT gadgets for instructional conveyance in secondary schools in Ebonyi State, Nigeria. it was established in addition to other things that ICT gadgets are not adequately available, most accessible ICT gadgets are not in good working condition in schools studied, along these lines they are not sufficiently utilized and trained staff are not also adequately accessible to operate the functional ones. Apagu and Bala (2015) examined the accessibility and use of ICT facilities for instructing and learning Vocational and Technical Education in Yobe state. The investigation discovered that ICT services were insufficient in specialized schools. ICT facilities, for instance, computer, TVs, CCTV et cetera are not adequately available in schools. Educators/learners' level of experience in the usage of ICT in schools was low.Ofodu and Oso (2015) explored the level of English Language secondary teachers' Information and Communication Technology resources utilization. The results demonstrated that instructors‟ level of awareness to information and communication technology resources was high however the level of utilization was low. Similarly, it was established that the level of educational skills of the instructors was low.

Globally, ICT has progressed toward becoming one of the building blocks of present-day society. First experience with instructing and learning has gotten little consideration for a long time not disapproving of its advantages. Science (Biology) being a discipline that is worried about dynamic, imaginative, shared and assessing learning is one of the discipline appropriate for ICT consistence. Educators exhibit diagrammatically on writing board, real ideas that require pragmatic show with the utilization of ICT facilities. The students simply take a seat and tune in to the educator, this technique of conveying guideline to the student, don't enable the learners to be straightforwardly connected with the learning procedure rather it puts the instructor at the centre, while the students are insignificant latent audience members. At the point when students are not effectively associated with the educating and learning process, they are not given the chance to think and take care of issues without anyone else. This will advance participatory learning and the students will have the capacity to structure his/her own particular learning skill. Likewise, there is an issue of insufficient financing of ICT facilities by the school administration (government), deficient infrastructural facilities, lack of maintenance of ICT devices, poor power supply and lacking instructional materials utilized by instructors to convey guideline to the students. Government has neglected to prepare Biology educators to get together the consistently changing pattern in ICT. Thus, the problem of the study was to find out Biology teachers and their students' perception about Availability and Utilization of ICT facilities in instructing and learning of Biology in secondary schools in Khana Local Government Area.

Research Objectives

This paper addressed several objectives which includes to;

1. determine the functional ICT facilities available for teaching of Biology in public secondary schools in Khana local government area;
2. ascertain the utilization level of ICT facilities by teachers in teaching of Biology in senior secondary schools; and,
3. find out the utilisation level of ICT facilities by students in learning Biology in senior secondary schools.

Research Questions

The following research questions guided the study

1. What are the functional ICT facilities available for teaching of Biology in public secondary schools in Khana local government area?

2. What is the utilization level of ICT facilities used by teachers in teaching of Biology in senior secondary schools?
3. What is the utilization level of ICT facilities utilized by students in learning of Biology in senior secondary schools?

Research Hypothesis

The following null hypothesis was tested at 0.05 level of significance.

1. There is no significant difference between the utilization level of ICT facilities by teachers and students in teaching and learning of Biology in senior secondary schools.

II. REVIEW OF LITERATURE

Conceptual Review of ICT Facilities utilized in the Teaching and Learning of Biology

The ICT facilities which can be employed in the educating and learning of Biology includes;

1) Computer Hardware components

2) Computer Software components

3) Internet

A computer system is a gathering of a computer parts that are required for a computer to work adequately as a whole. A computer comprises of hardware and software parts. The hardware parts of a computer involve all the fundamental obvious (tangible) materials or equipment utilized as information and communication technology component like monitor, projector, microphone, central processing unit or a computer (CPU), keyboard, mouse, camera machine, scanner, printer, speaker and so forth.

Interactive White Board: The interactive whiteboard (IWB) is part of ICT that improve learning and teaching of Biology and can combine a lot of valuable characteristics of ICT in one medium. Isman, Abanmy, Hussein and Alsaadany (2012) is of the view that Interactive whiteboard is ‘‘a huge touch-sensitive and collaborative show that interfaces to a PC and projector”. The utilization of IWB might be the most significant transformation in the classroom learning environs in the previous decade. A multiplicity of applications can be shown including: online resources for entire class teaching; sound clips, video clips and pictures (including flash images) to aid clarify concepts; software demonstration; demonstration of patterns and emphasizing criteria; scanning textbook pages and highlighting to exhibit note making; making digital flip charts; manipulating text; saving notes; speedy revision, editing, and recording; and consecutive lessons that flow consistently (Hall and Higgens, 2015).

The software on the other hand, alludes to the virtual or in most case the immaterial part of the ICT component which works in an integrative path with the hardware to collect, analyze, process and transmit the output for users' consumption. It involves the electronically or otherwise integrated artificial intelligence into the hardware which controls their activities in producing the desired media effect from them. They can be in type of programmes installed into computer system. Film strips in projector, Films in cameras, multimedia CDs, Interactive games, 3-D animation, Drill and practice, without them, the hardware will be futile in teaching and communicating Biology instructional materials to the instructor and the student. They additionally incorporate the power point, spread sheets, database, coral draw, and games. These software packages are of extraordinary significance to educating and learning.

Internet: This is the core of Information Age. It is referred to as “the mother of all systems.” It is an extensive computer network accessible to everybody with a microcomputer and a means to connect it. It is a worldwide computer network which connects a huge number of smaller networks. The network is comprised of wires, cables and satellites. Park (2012) expressed that the Internet has transformed into a basic medium of communication as an exploration and entertainment device. The reason is that it gives various opportunities to many people around the world in an extensive variety of ways. Basically, the Internet offers two standard advantages which are communication and information. On a more comprehensive premise, it can be pointed out that the Internet has a couple of capacities, especially in instruction, and these can be recorded as (I) storage of data (ii) communication without boundaries, (iii) online intuitive learning, (iv) automated/online research, (v) progression in the new world, (vi) improve enthusiasm for learning, (vii) worldwide education, and (viii) information catalogues.

III. RESEARCH METHODOLOGY

The study used the descriptive survey research design.The population of the study consisted of 50 Biology teachers of senior secondary schools and 6887 senior secondary school students. The sample of 296 SS1 students and 12 Biology teachers were selected from the six schools using Simple random sampling technique.

Checklist and Questionnaire were the instruments for data collection. The checklist was used to ascertain the functional ICT facilities available in public schools in Khana Local Government Area. Questionnaire instrument was divided into two sections. Section A consist of the personal data of teachers and students, section B consist of availability and utilization of ICT in teaching of Biology (AUICTTB) and availability and utilization of ICT in learning of Biology (AUICTLB).

Questionnaires were used, Structured in a modified likert scale of

High Extent (HE)	4points
Large Extent (LE)	3points

Moderate Extent (ME) 2 points

Low Extent (LO), 1 point

To ensure that the instrument measures what it is intended to measure the face validity was employed. A reliability index of 0.79 and 0.75 using Cronbach alpha was determined for both Teachers and Students respectively. Data gotten from checklist were analysed utilizing frequency counts and percentages and Data obtained from Questionnaires were analysed utilizing mean and standard deviation for research questions while Z-Test was used to test for hypotheses at 0.05 level of significance.

IV. RESEARCH ANALYSIS

Research Question 1: what are the functional ICT facilities available for teaching of Biology in public secondary schools in Khana Local Government Area?

Table 1 Checklist used for functional ICT facilities available in teaching of Biology

S/N	ICT facilities	Available ICT	Non Available
A.	**Hardware components**		
1.	Computer	**3 (50%)**	**3 (50%)**
2.	Keyboard	3 (50%)	3 (50%)
3.	Mouse	2 (33%)	4 (67%)
4.	Monitor	2 (33%)	4 (67%)
5.	Central processing unit (CPU)	2 (33%)	4 (67%)
6.	CD ROM	4 (67%)	2 (33%)
7.	Photocopying machine	4 (67%)	2 (33%)
8.	Printers	5 (83%)	1 (17%)
9.	Speakers	3 (50%)	3 (50%)
10.	Scanning machine	1 (17%)	5 (83%)
11.	Projectors	-	6 (100%)
12.	Interactive whiteboard.	-	6 (100%)
B.	**Software components**		
13.	Educational Programme	1 (17%)	5 (83%)
14.	Educational documentation	-	6 (100%)
15.	Educational games	-	6 (100%)
16.	Encyclopedias	-	6 (100%)
C.	**Internet**		
17.	E-mail	1 (17%)	5 (83%)
18.	Modems	2 (33%)	4 (67%)
19.	Wi-fi	-	6 (100%)
20.	Google	2 (33%)	4 (67%)

Table1 shows that there is a low presence of functional ICT facilities.

Research Question 2: What is the utilization level of ICT facilities used by teachers in teaching of Biology in senior secondary schools?

Table 2: Mean and Standard deviation of ICT facilities utilized by teachers in teaching of Biology in senior secondary schools

S/NO	ITEMS	$\bar{x}$	SD	Remarks
1.	Internet facilities are utilized in instructing and learning of Biology.	2.33	1.15	Low
2.	The teachers are proficient in the use of a computer system which makes learning interesting.	2.83	1.03	High
3.	ICT facilities like the interactive white board and projector are not always utilized by Biology teachers.	1.67	0.98	Low
4.	Biology teachers describe and demonstrate the basic features of application software packages.	2.33	1.15	Low
5.	There is a computer laboratory in my school used in teaching of Biology.	2.00	1.28	Low
6.	Irregular power supply deters the utilization of computer in my school.	1.67	0.98	Low
7.	Computer simulation helps Biology teachers to teach easily.	2.43	1.17	Low
8.	Teaching Biology with computer makes teaching-learning more effective.	3.25	0.75	High
9.	Application software like the Computer Simulation helps the student to visualized abstract and difficult concept in Biology.	2.67	0.78	High
10.	Teachers do not make use of computer simulation while teaching difficult concepts in Biology.	1.67	0.98	Low
11	Biology teachers do not have necessary skills and knowledge to implement computer effectively.	2.67	1.07	High
12.	Teaching with computer improves quality of work of both teachers/students.	3.50	0.52	High
	Grand Mean	**2.42**	**0.98**	**Low**

The table 2 showed the extent of ICT facilities utilized by teachers in teaching of Biology in senior secondary schools are in a low extent.

Research Question 3: what is the utilization level of ICT facilities utilized by students in learning of Biology in senior secondary schools?

Table 3: Mean and Standard deviation of ICT facilities utilized by students in learning of Biology in senior secondary schools

S/NO	ITEMS	$\bar{x}$	SD	Remarks
1.	Internet facilities are used in teaching and learning of Biology.	2.00	1.08	Low
2.	My teachers are proficient in the use of a computer system which makes learning interesting.	2.75	1.05	High

3.	ICT facilities like the interactive white board and projector are not always utilized by Biology teachers in my school.	2.00	1.08	Low
4.	My Biology teachers describe and demonstrate the basic features of application software packages.	2.29	1.05	Low
5.	There is a computer laboratory in my school used in learning of Biology.	1.68	1.01	Low
6.	Irregular power supply hinders the use of computer in my school.	2.68	1.09	High
7.	Computer simulation helps me as a student to learn easily.	2.00	1.08	Low
8.	Learning Biology with computer makes teaching-learning more effective.	2.82	1.02	High
9.	Application software like the Computer Simulation helps me as a student to visualized abstract and difficult concept in Biology.	2.34	1.06	Low
10.	My teachers do not make use of computer simulation while teaching difficult concepts in Biology.	2.17	1.12	Low
11	My Biology teachers do not have necessary skills and knowledge to implement computer effectively.	3.31	1.45	High
12.	Teaching with computer boosts quality of work of both instructors/students.	3.40	0.84	High
	Grand Mean	**2.45**	**1.07**	**Low**

Table 3 shows that ICT facilities utilized by students in learning of Biology in senior secondary schools are in a low extent.

Hypothesis 1: There is no significant difference between the utilization level of ICT facilities by teachers and students in teaching and learning of Biology in senior secondary schools.

Table 4: Z-test analysis showing the differences in the utilization of ICT facilities by teachers and students

variables	**N**	**SD**	$\bar{x}$	**df**	**P-value**	**z-cal**	**z-cri**	**Remarks**
Students	296	1.07	2.45	306	0.940	0.076	1.96	Not Significant Accept H_O
Teachers	12	0.98	2.42					

P>0.05; not significant at 0.05 level of significance

Table 4 showed the utilization of ICT facilities by teachers and students in teaching and learning of Biology in senior secondary schools.

V. DISCUSSIONS OF FINDINGS

The Table 1 shows that out of the three categories of ICT facilities, only few hardware components were functional (as 50% or more of the schools have it) such as computer, keyboard, CD ROM, photocopying machine and printers. However, the result revealed that the software component, such as Educational Programme, Educational documentation, Educational games and Encyclopaedias were not available in the schools. Internet and Interactive whiteboard system were completely not available. This implies that the few computer facilities present are mainly for office use while the major computer programmes required for teaching and learning are either absent or non-functional.

This above result is in agreements with the work of Aja and Eze (2016), it was found that ICT facilities are not sufficiently available, most available ICT facilities are not in good working condition, hence they are not sufficiently used.

The table 2 showed that seven items, that is item 1, 3, 4, 5, 6, 7, and10 have a mean value of 2.33.1.67, 2.33, 2.00, 1.67, 2.43 and1.67 respectively, these mean values falls below the criterion mean of 2.5. However, item 3 and 4 affirmed that ICT facilities like the interactive whiteboard and projectors are not utilized in teaching, also Biology teachers describe and demonstrates the basic features of application software packages. five items have mean value that falls above the criterion mean of 2.5 These are item 2, 8,9, 11 and 12 with mean value of 2.83, 3.25, 2.67, 2.67 and 3.50 respectively (High extent). ICT facilities utilized by teachers in teaching of Biology in senior secondary schools are in a low extent. The implication is that ICT facilities utilized by teachers in teaching of Biology in senior secondary schools are in a low extent (2.42), since the grand mean falls below the criterion mean of 2.5.

The table 3 showed that seven items, that is item 1, 3, 4, 5, 7, 9 and 10 have a mean values of 2.00, 2.00, 2.29, 1.68 ,2.00, 2.34 and 2.17 respectively (low extent), have mean values that falls below the criterion mean of 2.5 five items have mean values that falls above the criterion mean of 2.5. These are item 2, 6, 8, 11 and 12 with mean values of 2.75, 2.68, 2.82, 3.31 and 3.40 respectively (High extent). ICT facilities utilized by students in learning of Biology in senior secondary schools are in a low extent. The implication is that ICT facilities utilized by students in learning of Biology in senior secondary schools are in a low extent (2.45) since the grand mean falls below the criterion mean of 2.5.

The statistical analysis and testing of hypothesis one in table 4 showed the utilization of ICT facilities by teachers and students in teaching and learning of Biology in senior secondary schools. The students had the mean score of 2.45 with a standard deviation of 1.07 while the teachers had the mean score of 2.42 with a standard deviation of 0.98. Z-test analysis showed that the probability associated with the calculated value of z (0.076) is 0.940. Since the probability value of 0.940 is greater than 0.05 level of significance, the null hypothesis is accepted. Hence, there is no significant difference in the mean score of students and teachers in the utilization of ICT facilities.

To further explain the result, this result is in line with Apagu and Bala (2015) who examined the availability and use of ICT facilities for instruction and learning Vocational & Technical Education in Yobe State. The investigation revealed that ICT facilities was not accessible in technical colleges, ICT facilities such as PC, TV sets are not sufficiently available in secondary schools, Teachers/Students‟ level of exposure to the utilization of ICT in secondary schools was low. The above result is in line with the works of Ofondu and Oso (2015) who explored the level of English Language secondary teachers' Information and Communication Technology resources utilization. The results demonstrated that instructors' level of awareness to Information and Communication Technology resources was high however the level of utilization was low.

VI. CONCLUSION

The study concluded that there is low presence of functional ICT facilities available in teaching and learning of Biology in public secondary schools in Khana Local Government Area. The study discovered that the software components, internet and the interactive whiteboard system were completely non-available. Teachers and Students utilized ICT facilities to a low extent in teaching and learning of Biology in senior Secondary Schools. There is no significant difference in the utilization level of ICT facilities by students and teachers in teaching and learning of Biology.

VII. RECOMMENDATIONS

The following recommendations were made based on the findings of the study.

1. Non-Governmental Organization, Government, Cooperative bodies, multinational cooperation and individual ought to guarantee the provision of functional ICT facilities in both private and public schools; this will improve quality teaching and learning. ICT facilities ought to all the time be upgraded and well maintained. The Ministry of Education ought to appoint a committee that will guarantee the functional ICT facilities available are in good working condition.

2. Enlightenment campaign, workshops and seminars ought to be organized for teachers and students by Education Authorities – Federal and State Ministries of Education to create awareness of the functional ICT facilities strategies/techniques that will advance increase motivation of students and instructors in teaching and learning.

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