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Assessment of the Availability and Utilization of ICT in Teaching Biology in Senior Secondary Schools

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Abstract

This research work was undertaken with view to assess the availability and utilization of the ICT in teaching biology in Senior Secondary Schools in Nsukka Local Government Area of Enugu state. Four research questions were formulated to guide the study. The study employed survey research design. The sample size for the study was 100 SS2 students drawn from the population of the study using simple random sampling techniques. The instrument for data collection in this study were (write down the two instruments and their abbreviations) The reliability of the instruments was 0.83 which was established using Cronbach alpha. The data collected were analyzed using mean, standard deviation. The results obtained from the study revealed among others that

erractic power supply, insufficient knowledge on how to use ICT, short supply of ICT facilities are some of the factors militating against the effective utilization of ICT in Nsukka Local Government Area. From the findings, it was also discovered that ICT facilities are not available and the few that available are not utilized. Based on the findings, it was recommended among others that Biology teachers should be sponsored to attend workshops, conferences and symposium on how to use ICT facilities in teaching. Federal, State and Local Government, corporate bodies and PTA should extend helping hands in the provision of ICT facilities to schools within their locality. Finally the limitations of the study and suggestions for further studies were equally made.

Keywords: Information and Communication Technology (ICT), Biology Teaching, ICT Availability and Utilization, Senior Secondary Schools, Nsukka Local Government Area

Introduction

Science is the process of learning about the natural world through observation and experimentation. Science is the process of asking a scientific enquiry about living and non-living things in the environment. Science is the pursuit and application of knowledge and understanding of the natural and social world following a systematic methodology based on evidence^[1]. Aniodoh^[2], viewed science as a body of knowledge arrived at through systematic and procedural processes based on tentative observation and experiment. Science according to Attiji^[3] is a dynamic human activity concerned with understanding of the working of the world.

Biology is a branch of science that deals with the study of life and living things, including their structure, function, growth, evolution and distribution and taxonomy^[4]. Biology has a great position in the secondary school education curriculum due to its significance as a life science and as a core subject. It is mandatory for science students in all secondary schools in Nigeria to

study it as a pre-requisite to study courses relevant to humanity such as: Medicine, Pharmacy, Biochemistry, Agriculture, Anatomy, Physiology, Botany, Zoology, Microbiology, Cell biology, Ecology, Entomology, Immunology, and Genetics among others. Biology contributes immensely to the technological development of a nation^[4]. It is a practical subject which equips students with concepts and skills, which are useful in solving day-to-day challenges in life. Understanding biology may be key to solving certain global issues, for example, if a country suffers from food shortage, biology will be utilized to develop effective and long term strategies of increasing food production. One of biology's most significant contributions is to pave the way for human to conduct new scientific research^[5]. The importance of biology in genetics and DNA is also noteworthy because scientist can now pinpoint why some people are predisposed to diseases, how those diseases are passed from generation to generation, even work on genetic improvement to eradicate undesired features in people^[6].

Despite the popularity and importance of biology, the results of biology students have been consistently poor over the years^[7]. The underperformance of Biology students in West African Senior School Examination in Nigeria has become a worrisome situation that calls for urgent attention. This is because the West African Examination Council (WAEC) Chief Examiner's Report for 2013, 2014, 2015, 2016, 2017 and 2018 stated that students' performance in Biology as seen in Table 1 was very poor.

Table 1: Performance of students in biology at SSCE level from 2013 to 2018

Year	Number of students present	Number of the students who pass	A number of the students fail	% Pass	% Fail
2013	182659	39125	143534	21	79
2014	228953	80355	148598	35	65
2015	250099	86150	163949	34	66
2016	289520	84520	205000	29	71
2017	326541	98215	228326	30	70
2018	367543	120560	247002	33	67

Source: Department of Statistics, WAEC

According to WASSCE Report 2018, biology students exhibited the following lapses: Inability to properly interpret questions, failure to write or answer their questions logically, systematically and convincingly, poor drawing skills, shallow understanding of most concepts in Biology, poor power of expression, inability to relate features to functions; -inability of the candidates to spell many Biological terms, correctly. Based on this, studies have shown that there are factors responsible for the poor achievement such as: Lack of qualified teachers, low level of interest and commitment on the part of students, the nature of some of the topics, teacher's poor knowledge of the subject matter, non-availability of resource materials and over loaded curriculum. Also, there are other factors responsible for students' poor performance in biology such as lack of adequate instructional materials, lack of adequate laboratory activities, use of ineffective method of teaching, over loaded biology syllabus and lack of ICT facilities in secondary schools. The influence of ICT on biology can help advance the capacity of the students to access, adopt and apply knowledge to tackle the complex issues in biology. Hence, the need to examine the availability

and utilization of ICT in teaching biology. This is because the influence of ICT on biology is to advance the capacity of every learner to generate access, adopt and apply knowledge and information to tackle complex issues in biology.

Information Communication and Technology (ICT) is a combination of network hardware and software as well as a convergence of information, communication and technology. ICT is defined as the forms of technology that are used to transmit, process, store, create, display, share or exchange information by electronic means^[8]. Information and Communication Technology, includes all forms of technologies such as internet, computers, websites, telephones, mobiles, wireless devices, networks, hardware, software and telecommunication equipment^[9]. The use of technology involves a hand-on teaching approach that prompt students to learn by interacting with course materials through video, active discussion and outline game and activities^[10].

The use of ICT in education and training has been a key priority in Nigeria in the last decade, although progress has been uneven^[11]. The advantages of ICT cannot be over emphasized as it helps establish a friendly atmosphere between teachers' and learners, helps boost learner self-reliance and self-esteem, encourage cooperation among learners, enables learners to overcome their fears and language barrier, keeps participants engaged in activity and assists low-achieving students. The integration of information and communication technologies can help students toward educational planning and development. The use of ICT has changed the conventional ways of learning and proposes the need to rethink education in terms of a more current context. Therefore, the need arises to access the availability and utilization of ICT in teaching biology in secondary schools.

Assessment involves various processes. The six processes involved in assessment include; develop student learning outcomes, develop and implement methods of assessment (direct and indirect measures), determine criteria for success, collect and analyze data, plan (and execute) improvement actions, and document assessment and improvement activities. Assessment could be norm or criterion referenced depending on objective of the assessor and the type of instrument with which the assessment is carried out. It is norm referenced when the assessor wants to find out the relative standing of the testees - (students/individuals taking a test) - taking the test compared to their mean score. It is criterion referenced when a student's mastery of the ability assessed is confirmed if he attains the benchmark or target set for the assessment. Assessment has many functions for education.

Over the years the persistent low level of achievement in biology at the senior secondary school internal and external examinations in Nigeria has continued to attract the attention of major stakeholders in education. And failures in Biology may result in shortage of experts like doctors, biologists, and teachers. Research has shown that they are factors which contribute to the poor performance of student in biology such as lack of qualified teachers, non-availability of resource materials, outdated curriculum, etc. A lot of provision of facilities, policy reforms, syllabus and curriculum implementation has been done, but there has been little or no improvement in the general performance of students in Biology. With the availability and utilization of ICT, it could help curb the situation. The utilization of ICT by teachers will enhance effective teaching through, good course organization, effective class management, content creation,

self-assessment, self-study collaborative learning, task oriented activities, and effective communication between the teachers and learners and also research activities will be enhanced by the use of ICT.

Hence, the need to investigate the availability and utilization of ICT in teaching biology in senior secondary schools in Nsukka LGA. The purpose of this study is to assess the availability and utilization of ICT in teaching biology in senior secondary schools in Nsukka LGA.

Materials and Methods

Design of the study

The design of the study is a descriptive survey design. Descriptive survey research design, according to Nworgu^[12] is one in which a group of people or item is studied by collecting and analyzing data from only a few people or item considered to be a representative of the entire population. It is a research which describes certain event naturally. Descriptive survey design was considered appropriate as it enable the researchers to obtain first hand primary information from a large population of respondents in their natural setting and it also involves the use of questionnaire for the collection of data on assessing the availability and utilization of ICT in teaching biology in senior secondary school.

Area of the study

The study will be carried out in Nsukka local government area(LGA) of Enugu state, Nigeria. Nsukka Local Government Area is geographically located in the Northern part of Enugu state. It is one of the 17 Local Government areas in Enugu state. It is made up of three development councils, which are Nsukka Central, Nsukka East and Nsukka West development councils.

Population

The population of the study consists of 2691 SS 2 Students in public schools in Nsukka Local Government of Enugu state. A total number of 1166 males and 1525 females as 1525 students were distributed in the 31 schools in Nsukka Local Government of the state.

Sampling and sampling technique

Four (4) public secondary schools were selected at random from the 31 secondary schools in Nsukka local government of Enugu state. Stratified random sampling technique based on urban/rural location was adopted in the selection of the 4 schools in the Local Government area. Therefore a total number of 100 students were drawn for the study.

Instrument for Data Collection

The researchers adopted a checklist and a questionnaire as the instrument for the data collection. The title of the instruments was a Checklist on Assessment of the Availability and Utilization of ICT in Teaching Biology in Senior Secondary Schools (CAAUITB) and a Questionnaire on Assessment of the Availability and Utilization of ICT in Teaching Biology in Senior Secondary Schools (QAAUITB). The CAAUITB was on the availability of ICT, it was structured to know if the equipments written were available or not available in the school. The QAAUITB was divided into four clusters. The first cluster was on utilization of ICT, The second cluster was on the factors affecting the utilization of ICT and the third cluster was on the strategies to solve issues affecting the use

of ICT. The QAAUITB was scored on a four-point scale in the reference to Strongly Agree (SA -4points), Agree(A-3points), Disagree(D-2points), Strongly Disagree(SD). The respondents were to respond to the items by ticking (√).

Validity of the instrument

The instrument was validated by three Specialist, two from Biology unit one from Measurement and Evaluation unit, of the Faculty of Education, University of Nigeria, Nsukka (UNN). The instruments were subjected to face and content validity. The Specialist were to determine which of the items are suitable and can elicit the intended response and information, clarity and appropriateness of language.

Reliability of the instrument

To ensure the reliability of the instrument, a Cronbach alpha statistics technique was employed and a reliability coefficient of 0.83 was obtained, which indicated that the instrument is reliable.

Method of Data Collection

The QAAUITB was administered to student with the help of research assistant. Permission was sought from the principal before the administration of the instrument. The research assistants were instructed on the strategies to follow to enhance maximum retrieval of questionnaires, which was the questionnaire was to be filled and collected on the spot. In effect, a total of 100 copies were administered to the students.

Method of Data Analysis

The research questions were answered using frequency distribution and mean to analyze the data obtained.

Results

Research Question One

What are the available ICT facilities for teaching Biology?

Table 1: Frequency Percentage of Respondents on Available ICT Facilities for Teaching Biology

(n = 100)

S. No	Item	Frequency	Percent	Decision
1.	Desktop computers	25	25.0	Not available
2.	Laptops	38	38.0	Not available
3.	Projector screen	30	30.0	Not available
4.	Multimedia projector	21	21.0	Not available
5.	Wi-Fi/ internet	24	24.0	Not available
6.	Computer Laboratory	29	29.0	Not available
7.	Software package	34	34.0	Not available
8.	Printer	17	17.0	Not available
9.	Photocopying machine	53	53.0	Not available
10.	Interactive whiteboard	19	19.0	Not available
11.	Radio tape	31	31.0	Not available
12.	Mobile phone	40	40.0	Not available
13.	Uninterrupted power supply(UPS)	30	30.0	Not available
14.	Scanners	43	43.0	Not available
15.	Camera	28	28.0	Not available
16.	Palm top	29	29.0	Not available
17.	Presentation clickers	21	21.0	Not available
18.	Flash Drive	65	65.0	Available
19.	Microphones	23	23.0	Not available
20.	Speakers	29	29.0	Not available

Table 1 above showed the response of respondents on available ICT facilities for teaching Biology. Items 1, 2, 3, 4,

5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, and 17 had 25.0, 38.0, 30.0, 21.0, 24.0, 29.0, 34.0, 17.0, 53.0, 19.0, 31.0, 40.0, 30.0, 43.0, 28.0, 29.0, 21.0, 23 and 29.0 percentages respectively. These items were below 50 percent cut off-mark, showing that the facilities were not available. The item 18 had 65.0 percent which was above 50 percent cut-off mark which indicated the facility was available. Therefore the results showed that ICT facilities are not available for teaching Biology in secondary schools in Nsukka Local Government Area.

Research Question Two

To what extent do biology teachers utilize ICT?

Table 2: Mean and Standard Deviation of Respondents on The Extent Biology Teachers Utilize ICT

(n = 100)				
S. No	Item	Mean	SD	Decision
21.	Desktop computers	1.74	.79	VLE
22.	Laptops	1.70	.80	VLE
23.	Projector screen	1.80	.77	VLE
24.	Multimedia projector	1.80	.80	VLE
25.	Wi-Fi/ internet	1.34	.59	VLE
26.	Computer Laboratory	1.61	.84	VLE
27.	Software package	1.88	.88	VLE
28.	Printer	1.84	.93	VLE
29.	Photocopying machine	1.32	.47	VLE
30.	Interactive whiteboard	1.57	.87	VLE
31.	Radio tape	1.82	.87	VLE
32.	Mobile phone	1.72	.84	VLE
33.	Uninterrupted power supply(UPS)	1.61	.80	VLE
34.	Scanners	1.52	.67	VLE
35.	Camera	1.48	.69	VLE
36.	Palm top	1.48	.61	VLE
37.	Presentation clickers	1.79	.84	VLE
38.	Flash Drive	1.47	.74	VLE
39.	Microphones	1.53	.82	VLE
40.	Speakers	1.71	.92	VLE
	Cluster Mean	1.64	.40	VLE

Data in Table 2 showed that items 21 to 40 had mean ratings of 1.74, 1.70, 1.80, 1.80, 1.34, 1.61, 1.88, 1.84, 1.32, 1.57, 1.82, 1.72, 1.61, 1.52, 1.48, 1.48, 1.79, 1.47, 1.53, and 1.71 with the corresponding standard deviation of .79, .80, .77, .80, .59, .84, .88, .93, .47, .87, .87, .84, .80, .67, .69, .61, .84, .74, .82 and .92 respectively. All the mean ratings were below the benchmark of 2.50. The cluster mean of 1.64 indicated that all the ICT facilities are not utilized in teaching Biology in secondary schools in Nsukka Local Government Area.

Research Question Three

What are the factors militating against the utilization of ICT in teaching biology?

Table 3: Mean and Standard Deviation of Respondents on Factors Militating Against the Utilization of ICT in teaching Biology (n = 100)

S. No	Item	Mean	SD	Decision
41.	Lack of maintenance of the available ICT facilities	2.88	1.21	Agreed
42.	High cost of purchasing ICT facilities	3.06	1.20	Agreed
43.	Poor internet connections	2.84	1.26	Agreed
44.	Poor attitudes of some Biology teachers toward using modern technologies in teaching	2.80	1.27	Agreed
45.	Short supply of ICT facilities	3.00	1.12	Agreed
46.	ICT usage in teaching is not recommended in the biology curriculum	3.27	1.20	Agreed
47.	Insufficient knowledge of how to use ICT facilities	2.62	1.34	Agreed
48.	A limited number of Biology teachers who are ICT proficient	2.84	1.28	Agreed
49.	Dilapidated ICT laboratories	2.73	1.27	Agreed
50.	Lack of school timetable provision for ICT usage in teaching biology	2.76	1.19	Agreed
51.	Erratic electricity supply	2.41	1.25	Agreed
52.	ICT gadgets are expensive	2.75	1.07	Agreed
53.	Lack of security in the school ICT laboratories	3.21	.92	Agreed
54.	Lack of qualified ICT technicians in school	3.36	.85	Agreed
55.	Students are too much for the ICT facilities available in the school	2.88	1.06	Agreed
	Cluster Mean	2.89	.78	Agreed

Data in Table 3 showed that items 41 to 55 had mean ratings of 2.88, 3.06, 2.84, 2.80, 3.00, 3.27, 2.62, 2.84, 2.73, 2.76, 2.41, 2.75, 3.21, 3.36 and 2.88 with the corresponding standard deviation of 1.21, 1.20, 1.26, 1.27, 1.19, 1.20, 1.34, 1.28, 1.27, 1.19, 1.25, 1.07, .92, .85 and 1.06, respectively. All the mean ratings are above the benchmark of 2.50 except item 51 which is below the benchmark. The cluster mean of 2.89 indicated that all the items are factors militating against the utilization of ICT in teaching biology in secondary schools in Nsukka Local Government Area.

Research Question four

What are the strategies used to solve the challenges faced when using ICT in teaching biology?

Table 4: Mean and Standard Deviation Respondents on Strategies used to Solve the Challenges faced when using ICT in Teaching Biology (n = 100)

S. No	Item	Mean	SD	Decision
56.	Available ICT facilities should be properly maintained.	3.02	.98	Agreed
57.	The Government should supply ICT facilities to Secondary Schools.	2.65	1.10	Agreed
58.	Provision of school Wi-Fi to reduce poor internet connections	2.75	1.31	Agreed
59.	There should be positive attitudinal Change in Biology teachers toward using ICT in teaching.	3.14	1.03	Agreed
60.	Provision of computers and computer labs in secondary schools by Government individual and Non-Government Organizations	3.19	.87	Agreed
61.	The use of ICT in teaching should be integrated into the Biology curriculum	3.12	.94	Agreed
62.	Biology teachers should be sponsored to attend workshops on how to use ICT facilities in teaching.	2.92	1.10	Agreed
63.	Employing more qualified biology teachers who are ICT literate compliant	2.92	1.27	Agreed
64.	Build or rehabilitate dilapidated ICT laboratories in secondary schools.	2.96	1.12	Agreed
65.	There should be a school timetable provision for ICT usage in Teaching Biology.	2.74	1.28	Agreed
66.	Provision of Generator set	2.77	1.27	Agreed
67.	Supplying laptops to the teacher at a subsidized rate.	2.72	1.25	Agreed
68.	The computer laboratory should be secured at all time	2.58	1.16	Agreed
69.	Provision of well-qualified computer technicians in schools	2.59	1.11	Agreed
70.	Schools should accept the appropriate numbers of students to allow each person to make use of ICT	2.80	1.15	Agreed
	Cluster Mean	2.86	.67	Agreed

Table 4 showed that items 56 to 70 had mean ratings of 3.02, 2.65, 2.75, 3.14, 3.19, 3.12, 2.92, 2.92, 2.96, 2.74, 2.77, 2.72, 2.58, 2.59 and 2.80, with the corresponding standard deviation of .98, 1.10, 1.31, 1.03, .87, .94, 1.10, 1.27, 1.12, 1.28, 1.27, 1.25, 1.15, 1.11, and 1.15 respectively. All the mean ratings are above the benchmark of 2.50. The cluster mean of 2.86 indicated that all the items are the strategies used to solve the challenges faced when using ICT in teaching biology in secondary schools in Nsukka Local Government Area.

Summary of Findings

The summary of the findings are listed below:

1. ICT facilities are not available for teaching Biology in secondary schools in Nsukka Local Government Area.
2. ICT facilities are not utilized in teaching Biology in secondary schools in Nsukka Local Government Area.
3. All the items listed are some of the factors militating against the utilization of ICT in teaching biology Biology in secondary schools in Nsukka Local Government Area.
4. All the items listed are strategies that can be used to solve the challenges faced when using ICT in teaching biology in secondary schools in Nsukka Local Government Area.

Discussion

In this chapter, the findings of the study based on the four research questions that guided the study were discussed. The conclusion, educational implications, recommendations, limitations of the study, suggestions for further research and summary of the study were also presented.

Discussion of the Findings

- A) The availability of ICT facilities in teaching and learning biology.
- B) Extent to which ICT facilities are utilized.
- C) Factors militating against the utilization of ICT in teaching biology.
- D) Strategies used to solve the challenges faced when using ICT in teaching biology.

The Availability of ICT Facilities in Teaching and Learning Biology

The response to the research question one indicated that all ICT facilities listed for this study were not available for Biology teachers in teaching and learning of biology in senior secondary schools in Nsukka LGA. This is because a high percentage of the respondent are of the opinion that there are little or no presence of these facilities for the teaching of biology. Flash drive, photocopying machine, Printer are some of the ICT facilities that were available. The above findings therefore is in accordance with the study of Nwana, Ofoegbu and Egbe (2017) who in a study identified that in most secondary schools in Nigeria, there is dearth of Information and Communication Technology facilities for teaching and learning in secondary schools. The findings also validated that of Adelabu and Adu (2014) who in a study observed that ICT facilities were less available and accessed by teachers in most secondary schools.

Extent to which Facilities are Utilized

The findings revealed that the extent to which ICT is utilized in teaching biology in senior secondary school in Nsukka LGA is very poor. Very few of the technology are utilized for teaching and learning among teachers and students and this is because the availability of ICT is very low.

Factors Militating against the Utilization of ICT in Teaching Biology

The findings from research question three established whether there are significant factors affecting the utilization of ICTs for instructional purposes. Majority of the respondents are in agreement that all the factors are militating against the utilization of ICT. Some of which are lack of maintenance of the available ICT facilities, high cost of purchasing ICT facilities, poor internet connection, short supply of ICT facilities etc. This is in agreement with the report by Tellas *et al.*, [13] which stated that the factors hindering teacher's readiness and confidence in using ICTs are lack of ICT skills, insufficient knowledge of appropriate software, lack of knowledge of how to evaluate the use and the role played by ICT in teaching and learning, unavailability of infrastructure and insufficient knowledge of how to use ICT equipment.

Strategies used to solve the Challenges faced when using ICT in Teaching Biology

The findings from research question four established the

strategies used in solving challenges facing utilization of ICT in teaching biology. The respondents agreed that some of the strategies for solving challenges facing ICT utilization are; available ICT facilities should be properly maintained, provision of school Wi-Fi to reduce poor internet connections, the use of ICT in teaching should be integrated into the biology curriculum among others.. This is in line with Jegede ^[14], who recommended that the strategies used to prevent challenges facing effective administration of ICT are provision of ICT facilities, implementation of ICT policies on education, provision of constant electricity and internet services.

Conclusion

The results obtained from the analyses of the data gathered in this research indicated that majority of teachers and students do not have access to ICT. This is because the ICT facilities are not available for them to use and also the extent to which available ICT are utilized is to a very low extent. The result also shows that lack of maintenance of the available ICT facilities, high cost of purchasing ICT facilities, insufficient knowledge of ICT equipment on part of the teachers, dilapidated ICT laboratories, erratic power supply are some of the factors affecting the utilization of ICTs for instructional purposes. The finding further revealed that teachers' insufficient knowledge on how to use ICT hinders the effective implementation of ICT in secondary schools. The study also shows that application of ICT in the classroom makes lesson very interesting and easy to deliver. Effective implementation of ICT in secondary schools brings about effective teaching and learning and contributes to the performance of the students.

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