FACTORS AFFECTING THE USE OF INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) IN THE TEACHING AND LEARNING OF BIOLOGY IN SENIOR SECONDARY SCHOOLS IN EKITI STATE, NIGERIA

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Abstract

The study investigated factors affecting the use of information and communication technology (ICT) in teaching and learning of Biology in senior secondary schools in Ekiti State, Nigeria. Descriptive survey design was used. Two research questions were raised. The population of the study comprised all senior secondary schools in Ekiti State. Purposive sampling technique was used to select 40 Biology teachers and 64 Biology students in Ekiti State. The instrument for data collection from the respondents was a structured questionnaire designed separately for each of the teachers and students for data collection. For the reliability of the instrument a coefficient of 0.82 was obtained. Percentages, means and standard deviations were used in statistical analysis of the data collected. The finding of this study reveals that lack of effective training, background knowledge in ICT, irregular power supply are factors affecting the use of ICT in teaching and learning of Biology in senior secondary schools. Other factors include high cost of ICT facilities, poor of Internet connectivity, teachers' incompetence in the use of ICT, lack of access to ICT resources, teachers' lack of confidence, lack of computerized library, lack of motivation, and inadequate time to allow for ICT use in the of teaching and learning of biology in Ekiti State senior secondary schools. Thus, it was recommended that government should organize ICT conferences, workshops and seminars for biology teachers and make sure that all biology teachers attend these training programmes mandatorily and that government should provide adequate and functional ICT facilities in the senior secondary schools in order to motivate teachers.

Key Words: Biology, Information and Communication Technologies (ICT), Teaching, Learning

Introduction

Biology is one of the science subjects in the school curriculum designed to provide knowledge which is of value to the totality of education acquired. It is the science that is concerned with the study of living organisms, including their structure, function, growth, evolution, distribution, taxonomy, interrelationship between living things and their environment (Olayinka & Ayanda, 2019). Hornby (2011) defined Biology as the scientific study of life and structure of plants and animals. It is concerned with the characteristics, classification and behaviour of organisms, how species come into existence and the interaction they have with one another and with the environment.

Teaching and learning process have taken various dimensions with a view of ensuring that the students are guided by the teacher through planned activities so that they may acquire the richest learning possible from their experiences. Teaching with the aid of ICT facilities can aid better understanding because it makes the subject more interesting and gets the students involved in the learning process. The process of teaching and learning is complex in nature and can take a variety of forms in which every educational institution of today needs the help of technology to enhance effective teaching and learning. Ahmed, Bello & Gbigbadua (2016) stated that the application of ICT in biology education entails holistic and wholesome integration of modern telecommunication into education system and provides common level for all professionals to rub minds, share information and contribute towards effective and productive teaching and learning environment. Its connectivity allows the obtaining and sharing of information all over the world. Information and communication Technology (ICT) has brought a lot of changes in the educational settings.

Information and communication technology (ICT) according to Eze and Egbo (2014) is the use of computers, electronic and telecommunication equipment to process, store, retrieve, analyze and disseminate information in digital and other forms also, it is a group of associated technologies defined by their functional role in information access and communication with the computer and internet as key instrument. ICT is a viable tool for promoting the standard of education and invariably the standard of living of any nation.

ICT according to Amadi, Udo, Imuk, and Udoudo (2019) is also used to refer to the convergence of audio-visual and telephone networks with computer networks through a single cabling or link system. The concepts, methods and applications involved in ICT are constantly evolving on daily basis and that, ICT stresses the role of unified communication and the integration of telecommunication (telephone lines and wireless signals), computers as well as necessary enterprise software, middleware, storage and audio-visual systems which enable users to access, store, transmit and manipulate information. This allows users from all over the world to remain in contact and communicate on a regular basis.

The use of ICT in schools is so diverse that it is almost impossible to list all possible applications. Information communication technology (ICT) is an effective tool to improve the existing teaching and learning activities in education. It is believed that ICT can empower teachers and learners, transforming teaching and learning processes from being teacher-centered to student-centered. It is also a means of accessing, storing, sharing, processing, editing, selecting, presenting and communicating information through a variety of media (Eze, 2012). According to Shaibu (2011) ICT has the nature and scope of worldwide communication, changing business processes and erasing the traditional boundaries of the country. It is a significant development and an important advancement in the 21st Century. Asiyai (2010) stated that ICT refers to as a computer-based facilities used by organization personnel to record, transmit, generate, retrieve, impart knowledge and process information and communication needs and also stressed that ICT is any technology that students and teachers use to organize, create, manipulate, solve, find, draw, design, synthesize, share, collaborate, modify analyse, evaluate and disseminate information.

In the view of Ifueko (2012) ICT is digital processing and utilization of information by the use of electronic computers for storage, retrieval, conversion and transmission of information. The acquisition of computer and internet skills will enable student access internet for additional information about the topics taught to promote students understanding. The use of ICT in teaching and learning has the ability of improving students' performance. The importance of ICT in Nigerian secondary schools in general and in Ekiti State in particular cannot be overemphasized. The ICT is a by-product of the digitization era; it implies processing, storage and retrieval of information, and its transportation and/or exchange between sources/

terminals electronically (Ige, 2011). Ogu and Maduike (2012) viewed communication as a means whereby people in a setting receive and give information by way of exchanging concerning matter of interest. Ndirika and Kanu (201 2) defined ICT as a computer based tools used by people to work with the information and communication processing needs of an organization. Scientific knowledge is rapidly expanding with the use of resources and services (Etiubun &Akpan, 2017). These resources include computers, digital cameras, multimedia software applications, internet, television and videos affording services of exchange of information and knowledge, skills and ideas among other resources.

Ubogu and Evarista (2012) conducted a study on the challenges or problems militating against the effective utilization of information and Communication Technology (ICT) for teaching and learning in Uvwie Local Government Area of Delta State, Nigeria. The main purpose of the study was to examine the problem encountered by teachers in using ICT to teach in various secondary schools in Delta State. The findings showed that most schools in Uvwie Local Government Area lack most of the ICT tools that will enhance the integration of ICT into teaching and learning. Obiri-Yeboah, Kwarteng and Kyere-Djan (2013) investigated factors affecting ICT adoption tertiary institution in Ghana and stated that inadequate information technology facilities, insufficient ICT infrastructures and high cost of ICT facilities were the most important factors discouraging lecturers and students to adopt and use of ICT. It was showed that lack of knowledge and skills in using ICT, unwillingness to change and difficulty in linking ICT to curriculum were the important factors preventing lecturers and students from adopting and using ICT. To these authors, the reason is due to lack of adequate time for training and learning ICT in the institution.

Ibrahim (2016) identified a number of barriers that need to be overcome, that include crowded classrooms, inadequate number of ICT-related courses, lack of computers and other presentations equipment in classrooms, lack of computer laboratories for use in free time, lack of technology plans, lack of motivation of the teachers concerning the use of ICT in their classes, lack of motivation of the prospective teachers concerning the use of ICT in their courses, and their future classes, lack of good role models for prospective teachers and lack of successful institutional models. Therefore, the study seeks to investigate factors affecting the use of

information and communication technology in teaching and learning of Biology in senior secondary schools in Ekiti State.

Statement of the Problem

Teaching with the aid of ICT facilities can aid better understanding because it makes the subject more interesting and gets the students involved in the learning process. The process of teaching and learning is complex in nature and it can take a variety of forms which is why every educational institution of today needs the help of technology to enhance effective teaching and learning. According to Ugwu and Nzewi (2015) biology teachers play very prominent role in using ICT and molding up tomorrow's citizen. Biology teachers are expected to integrate ICT in the teaching and learning process. They must use technology so that it supports instruction and enables learners to use ICT as an important tool to meet their information and learning needs.

According to Osisioma (2012), Nigeria has been facing a lot of challenges in teaching and learning of science, such as lack of expertise in science teaching, lack of adequate laboratory equipment, the use of traditional method of teaching. These challenges do not only affect the shape and mode of operation but also the very goal of science education which biology is one of them in secondary schools. As a result of these, making progress in teaching and learning of biology has therefore become a far cry from what it should be.

Biology at the secondary school level in Nigeria has suffered severally because of dwindling interest of students in sciences. To make matters worse, lack of effective training background knowledge in ICT, irregular power supply, negative attitude and resistance to change, high cost of ICT facilities, lack of internet connectivity, lack of ICT classroom and laboratory, poor maintenance of existing facilities, lack of motivation and inadequate time to allow ICT use by the teachers and students have hampered the teaching and learning of biology. However, in most schools in Ekiti State, effective use of ICT in teaching and learning of biology is uncertain. It is on the basis of this that the researchers embarked on the present study to investigate factors affecting the use of information and communication technology in teaching and learning of Biology in senior secondary schools in Ekiti State.

Purpose of the Study

This study aimed at investigating the factors affecting the use of information and communication technology in teaching and learning of Biology in senior secondary schools. The specific objectives of the study are:

(1) to examine the factors affecting the use of ICT in teaching of biology in senior secondary schools in Ekiti state, Nigeria.

(2) to establish the factors affecting the use of ICT in learning of biology in senior secondary schools in Ekiti state, Nigeria.

Research Questions

The following research questions were answered in this study:

1. What are the factors affecting the use of ICT in teaching of Biology in senior secondary schools in Ekiti state, Nigeria?
2. What are the factors affecting the use of ICT in learning of Biology in senior secondary schools in Ekiti state, Nigeria?

Methodology

This section presents the entire procedure used in carrying out the study. It was dicsussed under the followings:

Research Design

The study used descriptive survey design. Descriptive survey design was used for its appropriateness in making reality known through collecting factual information that describes existing phenomena at a given moment in time.

Population of the Study

The study population comprised all senior secondary school two (SS2) biology students and biology teachers in Ekiti State. There were 3, 050 (SS2) biology students and 850 biology teachers in Ekiti State as at the time of conducting this study.

Sample and Sampling Technique

Purposive sampling technique was used to select 40 Biology teachers and 64 Biology students in Ekiti State. In all, the study used 104 participants.

Instrumentation

The research instrument used for data collection from the respondents was structured questionnaire for each of the biology teachers and the students. Biology Teachers Questionnaire (BTQ) and Biology Students Questionnaire (BSQ) were used in this study. The Biology teacher's questionnaires (BTQ) is a twenty (20) items structured in a five point Likert-type scoring scale of Strongly Agree (SA) = point, Agree (A) = 4 point, Undecided (U) =3 point, Disagree (D) =2 point and Strongly Disagree (SD) =1 point. The items of the questionnaire focused on the factors that affect the use of Information and Communication technology in teaching of biology in senior secondary schools in Ekiti State while BSQ is also is a twenty (20) items structured questionnaire using the five point Likert-type scoring scale of Strongly Agree (SA) = point, Agree (A) = 4 point, Undecided (U) =3 point, Disagree (D) =2 point and Strongly Disagree (SD) =1 point. The items of the questionnaire focused on the factors that affect the use of Information and Communication technology in learning of biology in senior secondary schools in Ekiti State

Validity of the Instrument

Face validity of the instrument was established before the instrument was administered to the respondents. The instrument was given to two biology teachers of over eight years teaching experience and an expert in test and measurement. Items that seemed unclear or ambiguous were removed and other suggestions given were used in constructing the final version of the instrument for the study.

Reliability of the Instrument

The reliability of the instrument was determined by trial testing the instrument, but which was not selected for the study. A coefficient of 0.82 was obtained. This high value established that the instrument was reliable. The Biology teacher's questionnaires (BTQ) was administered to forty (40) Biology teachers and while the Biology Student's Questionnaires (BSQ) was administered to sixty four (64) biology students by the researcher herself. All the administered questionnaires were collected after they had been filled by the respondents.

Method of Data Analysis

The data collected were analyzed using percentages, means and standard deviations to provide answers to the two research questions.

Results and Discussions

The results from the analysed data are presented in this section. This was followed by the discussions of the results.

Table 1:

Factors Affecting the Use of ICT in Teaching Biology in Senior Secondary Schools in Ekiti State, Nigeria.

S/N	Factors	SA (%)	A (%)	U (%)	D (%)	SD (%)	Mean	Std Dev.	Decision
1	Lack of effective training background knowledge in ICT	22 (68.8)	10 (31.2)	0 (0)	0 (0)	0 (0)	4.69	0.471	Agreed
2	Irregular power supply	11 (34.4)	20 (62.5)	1 (3.1)	0 (0)	0 (0)	4.31	0.535	Agreed
3	Negative attitude and resistance to change	12 (37.5)	18 (56.3)	1 (3.1)	0 (0)	1 (3.1)	4.25	0.803	Agreed
4	High cost of ICT facilities	7 (21.9)	20 (62.5)	2 (6.3)	2 (6.3)	1 (3.1)	3.94	0.914	Agreed
5	Poor/lack of internet connectivity	18 (56.3)	13 (40.6)	0 (0)	0 (0)	1 (3.1)	4.47	0.803	Agreed
6	Poor/lack of internet connectivity	19 (59.4)	11 (34.4)	1 (3.1)	0 (0)	1 (3.1)	4.47	0.842	Agreed
7	Teachers incompetence	18 (56.3)	13 (40.6)	0 (0)	0 (0)	1 (3.1)	4.50	0.672	Agreed
8	lack of access to ICT resources	15 (46.9)	13 (40.6)	0 (0)	1 (3.1)	3 (9.4)	4.13	1.212	Agreed

9	Lack of computer in classroom	15 (46.9)	16 (50.0)	1 (3.1)	0 (0)	0 (0)	4.44	0.564	Agreed
10	Crowded classroom	11 (34.4)	19 (59.4)	0 (0)	2 (6.3)	0 (0)	4.22	0.751	Agreed
11	Teachers insufficient ICT skills	15 (46.9)	15 (46.9)	1 (3.1)	1 (3.1)	0 (0)	4.38	0.707	Agreed
12	Teachers' lack of confidence	15 (46.9)	14 (43.8)	1 (3.1)	2 (6.3)	0 (0)	4.31	0.821	Agreed
13	Lack of computerised library	6 (18.8)	7 (21.9)	10 (31.3)	7 (21.9)	2 (6.3)	3.25	1.191	Agreed
14	Lack of motivation	10 (31.3)	14 (43.8)	7 (21.9)	0 (0)	1 3.1	4.00	0.916	Agreed
15	Inadequate time to allow ICT use	11 (34.4)	17 (53.1)	2 (6.3)	2 (6.3)	0 (0)	4.16	0.808	Agreed
16	Low teacher interest in using ICT	8 (25)	22 (68.8)	1 (3.1)	1 (3.1)	0 (0)	4.16	0.628	Agreed
17	Lack of role model	8 (25)	17 (53.1)	3 (9.4)	4 (12.5)	0 (0)	3.91	0.928	Agreed
18	Lack of incentives	6 (18.8)	12 (37.5)	8 (25)	4 (12.5)	2 (6.3)	3.50	1.136	Agreed
19	Lack of internet provision	6 (18.8)	6 (18.8)	6 (18.8)	8 (25)	6 (18.8)	2.94	1.413	Disagreed
20	Poor maintenance of existing facilities	14 (43.8)	16 (50)	2 (6.2)	0 (0)	0 (0)	4.31	0.535	Agreed

Table 1 above clearly showed that the mean ratings for all items except 19 are above 3.00 indicating agreement with the statements. All the items have high mean scores ranging from 2.94 to 4.47. This high score indicates that all the factors have mean score that are greater than 3.00 which is the cut- off point except item 19. The finding of this study reveals that the factors that are affecting the use of Information and Communication Technology in the teaching of Biology in senior secondary schools in Ekiti State included lack of effective training background knowledge in ICT, irregular power supply, negative attitude and resistance to change, high cost of ICT facilities, poor/lack of internet connectivity, teachers incompetence, lack of access to ICT resources, lack of computer in classroom, crowded classroom, teachers insufficient ICT skills, teachers' lack of confidence, lack of computerized library, lack of motivation, inadequate time to allow for ICT use, low teacher Interest in using ICT, lack of role model, lack of incentives and poor maintenance of existing facilities. It also implies that all the examined factors are affecting the use of ICT in the teaching of Biology in senior secondary schools in Ekiti State except lack of Internet provision which is below 3.00 indicating disagreement with the statement.

Table 2:

Factors Affecting the Use of ICT in Learning of Biology in Senior Secondary Schools in Ekiti State, Nigeria.

s/no	**Factors**	**SA (%)**	**A (%)**	**U (%)**	**D (%)**	**SD (%)**	**Mean**	**Std Dev.**	**Decision**
1	Lack of effective training background knowledge in ICT	46 (70.8)	14 (21.5)	3 (4.6)	2 (3.1)	0 (0)	4.60	0.725	Agreed
2	Irregular power supply	32 (49.2)	30 (46.2)	1 (1.5)	1 (1.5)	1 (1.5)	4.40	0.746	Agreed
3	Negative attitude and resistance to change	28 (43.1)	29 (44.6)	1 (1.5)	5 (7.7)	2 (3.1)	4.17	0.627	Agreed
4	High cost of ICT facilities	47 (72.3)	13 (20)	3 (4.6)	2 (3.1)	0 (0)	4.54	0.953	Agreed

5	Poor/lack of internet connectivity	26 (40)	37 (56.9)	0 (0)	2 (3.1)	0 (0)	4.34	0.644	Agreed
6	Lack of ICT classroom and laboratory	18 (27.7)	38 (58.5)	3 (4.6)	3 (4.6)	3 (4.6)	4.00	0.968	Agreed
7	Teachers incompetence	26 (40)	37 (56.9)	0 (0)	2 (3.1)	0 (0)	4.31	0.769	Agreed
8	lack of access to ICT resources		35 (53.8)	0 (0)	4 (6.2)	3 (4.6)	4.09	1.011	Agreed
9	23 (35.4)	17 (26.2)	44 (67.7)	2 (3.1)	2 (3.1)	0 (0)	4.17	0.627	Agreed
10	Crowded classroom	28 (43.1)	28 (43.1)	2 (3.1)	5 (7.7)	2 (3.1)	4.15	1.019	Agreed
11	Teachers insufficient ICT skills	25 (38.5)	34 (52.3)	3 (4.6)	3 (4.6)	0 (0)	4.25	0.751	Agreed
12	Teachers' lack of confidence	23 (35.4)	31 (47.7)	6 (9.2)	4 (6.2)	1 (1.5)	4.09	0.914	Agreed
13	Lack of computerised library	10 (15.4)	18 (27.7)	10 (15.4)	19 (29.2)	8 (12.3)	3.05	1.304	Agreed
14	Lack of motivation	17 (26.2)	40 (61.5)	2 (3.1)	5 (7.7)	1 (1.5)	4.03	0.865	Agreed
15	Inadequate time to allow ICT use	17 (26.2)	40 (61.5)	6 (9.2)	1 (1.5)	1 (1.5)	4.09	0.744	Agreed
16	Low teacher interest in using ICT	22 (33.8)	37 (56.9)	2 (3.1)	2 (3.1)	2 (3.1)	4.15	0.870	Agreed
17	Lack of role model	21 (32.3)	31 (47.7)	8 (12.3)	4 (6.2)	1 (1.5)	4.03	0.918	Agreed
18	Lack of incentives	11 (16.9)	26 (40)	6 (9.2)	15 (23.1)	7 (10.8)	3.29	1.296	Agreed
19	Lack of internet provider	17 (26.2)	19 (29.2)	9 (13.8)	16 (24.6)	4 (6.2)	3.45	1.287	Agreed

20	Poor maintenance of existing facilities	37 (56.9)	20 (30.8)	2 (3.1)	2 (3.1)	4 (6.2)	4.29	1.100	Agreed

Table 2 shows the factors that are affecting the use of Information and Communication Technology in the learning of biology by senior secondary schools students in Ekiti State. The mean scores range from 3.05 to 4.54. These mean scores are higher than the cut-off mean score of 3.00, thus the factors are all capable of influencing students' utilization of ICT in learning biology in Ekiti State senior secondary schools.

Discussion

Table 1 clearly showed that the finding of this study reveals that the factors that are affecting the use of Information and Communication Technology in teaching of Biology in senior secondary schools included lack of effective training background knowledge in ICT, irregular power supply, negative attitude and resistance to change, high cost of ICT facilities, poor/lack of internet connectivity, teachers incompetence, lack of access to ICT resources, lack of computer in classroom, crowded classroom, teachers insufficient ICT skills, teachers' lack of confidence, lack of computerized library, lack of motivation, inadequate time to allow ICT use, low teacher interest in using ICT, lack of role model, lack of incentives and poor maintenance of existing facilities. It also implies that all the examined factors are affecting the use of ICT in teaching of Biology in senior secondary schools in Ekiti State. The finding of this study was in agreement with Obiri-Yeboah, Kwarteng and Kyere-Djan (2013) and Ibrahim (2016).

Table 2 provided answers to research question two. It showed that lack of effective training background knowledge in ICT, irregular power supply, negative attitude and resistance to change, high cost of ICT facilities, poor/lack of internet connectivity, lack of ICT in classroom and laboratory, teachers incompetence, lack of access to ICT resources, lack of computer in classroom, crowded classroom, teachers insufficient ICT skills, teachers' lack of confidence, lack of computerized library, lack of motivation, inadequate time to allow ICT use, low teacher interest in using ICT, lack of role model, lack of incentives, lack of internet provider, poor maintenance of existing facilities are the factors capable of influencing students' utilization of

ICT in learning of biology in Ekiti State senior secondary schools. This result is in consonance with the findings by Ubogu and Evarista (2012) and Ibrahim (2016).

Conclusion

The study established that lack of effective training background knowledge in ICT and irregular power supply are factors affecting the use of ICT in teaching and learning of Biology in senior secondary schools.

Recommendations

Based on the findings of this study, the following recommendations are made:

1. Government should organize ICT conferences, workshops and seminars for biology teachers and make sure that all biology teachers attend these training programmes mandatorily.
2. Government should provide adequate and functional ICT facilities in the senior secondary schools in order to motivate teachers.

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