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Availability, accessibility and utilization of e-learning resources in teaching biology in senior secondary schools in Delta state

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Abstract
This study investigated availability, accessibility and utilization of E-learning resources in teaching biology in senior secondary schools in Delta state**.** Six research questions guided the study and three hypotheses were tested. The study adopted a descriptive survey research design. The population consisted of 431 biology teachers from public and private schools in Asaba and Agbor Education Zones of Delta State. There was no sample for the study as the population was of manageable size. Checklist questionnaire was the instrument used for data collection. The instrument was validated by four experts and tested for reliability. Cronbach alpha was used to establish the reliability of the instrument which yielded reliability index of 0.871. Frequency count, mean and standard deviation were used to answer the research questions while chi-square and independent t-test were used to test the null hypotheses at 0.05 level of significance. The findings of the study among others showed that most of the e-learning resources are available, accessible and utilized but not sufficient enough for teaching biology in secondary schools in Delta state. Findings of the study also revealed among others that there was no significance difference between public and private secondary schools on the extent of availability of e-learning resources for teaching Biology in Delta state. The study recommended among others that adequate e-learning resources should be provided for effective teaching and studying processes. Again, that instructional material is one of the major determinant of effective teaching and learning of biology in secondary schools which cannot be separated from teaching resources, it is therefore imperative to ensure they are made readily available during biology lessons by both the school head and the government as the case may be.

Keywords: Delta state, availability, accessibility and utilization of E-learning, asaba and agbor education

Introduction

Education is recognized as the nation's greatest asset towards the quick development of its technological advancement, scientific potentials, sociological and human resources. Hence it focuses on the integration of the individual into a sound and effective citizen. The Federal Republic of Nigeria, (FRN, 2014) [4], expressed the national goals of education to include: the acquisition of appropriate knowledge, technological skills, competencies; development of mental, physical and scientific abilities; equipment of individuals to live in and contribute meaningfully to the development of the society. The importance of education in general and technology education in particular in national development cannot be overemphasized. Technology education occupies a very high position in Nigerian educational policies. The Federal Republic of Nigeria (FRN) stated amongst other goals that: technology education shall emphasize the teaching and learning of information and communication technology and in addition to general education, the study of related information and communication technology skills.

These national goals could be in response to the rapid advancement in science and technology so that the country would be able to move forward and keep pace with development in other parts of the world. Science and its applied form of technology, have contributed to the comfort of man through the production of goods and services in various parts of the world. Science is acknowledged as the bedrock of national development. This implies that any nation who desires to attain national development must make science and technology education a priority (Ebuka, 2014). The Federal Government of Nigeria acknowledged the importance of science and technology education for all, hence she made provisions for science and technology education at all levels of education.

In pursuit of goals of "Science for all" current reforms in science and technology lay emphasis on scientific literacy and the need to achieve equity and excellence in education (Okeke in Nwana, 2018). In Nigeria, the situation is not different. The government through official policies and actions has demonstrated commitment to the inculcation of scientific and technological literacy among all Nigerians and not only those pursuing scientific or technological careers or science professions but also for those in non-science related courses. One obvious example of government action in this regard is making science subjects compulsory (that is, a core subject) in both Basic, Junior and Senior secondary schools and one of such subjects is Biology at the senior secondary school level.

Biology is the natural science that studies life and living organisms, including their physical structure, chemical processes, molecular interactions, physiological mechanisms, development and evolution (Aquarena Wetlands Project glossary of terms, 2014) [1]. Biology as a branch of science contributes immensely to the technological growth of the nation. According to Mary in

Ikeanumba (2021) [7], Biology is the branch of science that deals with plants and animals, their structure, function, growth and their relationship with their environment. It is a subject that permeates into all other science subjects. With knowledge of Biology, students are in a position to understand the structure and function of different parts of the body, the environment in which they live and how best to conduct themselves therein (Wikipedia, 2018).

Despite the important place of science in general and Biology in particular, evidence of poor achievement and performance in this subject abound. Educators are also becoming increasingly concerned about the poor achievement of students in the subject at both internal and external examinations. For instance, a review of students' achievement in Senior School Certificate Examinations (SSCE) in Biology from 2010-2022 in Nigeria showed a persistent trend of poor performance of students in Biology for students' result in Biology at West African Senior School Certificate Examination 2010 to 2022). It can be observed from the table that from 2010-2015, the number of Biology students who made grade A1-C6 was less than 50% of the students enrolled for the examination.

Many factors have been adduced for students' poor performance in Biology. Prominent among these factors are teacher quality, learner's factors, and the use of ineffective and teacher-centered methods in addition to the non-use of appropriate instructional materials for teaching Biology in secondary schools, among others with teaching methodology being the most dominant factor in Nigeria. In a bid to change the status quo the teaching methodology should be well strategized and include modern teaching materials as well as e-technology facilities. (Nzewi, in Nwana 2016; Okoli, in Nwana 2017). Bola (2018) [2] also reported that teachers lack of appropriate teaching and learning materials constitute major impediments to adequate implementation of Biology curriculum in Nigeria secondary schools.

For the products of Biology education (graduates) to maintain technological leadership, they must be equipped with technological competencies to meet up with the tremendous surge and demands of the ever-changing technologies in the world of work. Osuala (2019) [10] recognizes new technologies as a developing force. Technology has radically and positively impacted on education and training globally by transforming teaching and learning. The whole process of education, particularly the way teachers and learners gain access to knowledge and information in this 21st century, has been greatly affected by technology; especially ICT. Nwana (2009) [8] opined that both teachers and students achieve better curriculum outcome with the use of information and communication technologies (ICT). According to Haag, Cummings and McCubbrey in Ikeanumba (2017), the relatively new technologies are what are referred to as e-learning technologies. This is in support of Nwana (2009) [8] who opined that the integration of ICT into the teaching and learning process has introduced a new system of learning which is globally referred to as e-learning. The FRN (2014) encouraged the development of e-learning by stating that the government will provide basic infrastructures and facilities for ICT and learning.

E-learning means electronic learning. E-learning, can be described as a "virtual classroom". Edigbo (2014) [3] described e-learning as a type of learning conducted digitally via electronic media, typically involving the internet with a group of students assembled in a common virtual classroom to meet an instructor on-line (that is, in cyber space). The participants enroll by sending an e-mail to the instructor. The instructor sends out learning materials by electronic means to each participant.

E-learning is carried out through the use of a wide variety of resources such as computer, printer, scanner, internets, e-pen, e-portfolio, e-mail, e-book, e-reader, e-board, CD-ROM, diskettes, slides, Wi-Fi, Xender, digital camera, digital microscopes, flash drives, digital tapes, digital spreadsheets, digital beam balance, digital watch, digital glove, digital calculator, digital recorder and digital archives. Others are; digital television, projectors, e.g. multimedia projectors (MMP), teleconferencing devices, videoconferencing systems and artificial intelligent devices, example robots to mention but a few. There is need for availability of these mentioned e-learning resources in curriculum delivery.

Availability of e-learning resources means that the material resources to be used by the teacher for the attainment of the instructional objectives are there to be used by the teacher; and to be handled, interacted with or manipulated by the learners to enlist their active participation in curriculum delivery. According to Ibrahim (2015) [6], availability is the condition of being obtainable at a particular point in time. In this study, availability is the extent to which e-learning resources such as computer, scanner, printer, digital disks, among others are seen, gotten, found, obtained to be used by the teacher in teaching Biology. The availability of e-learning resources cannot guarantee teaching-learning effectiveness without accessibility of the resources.

Accessibility of e-learning resources means to reach, touch, feel, collect or get the e-learning resources such as computer, e-book, e-reader, e-pen, among others for curriculum delivery. Contextually, accessibility means laying hands on available e-learning resources so as to use them for teaching Biology. The Oxford Advanced Learners Dictionary (2015) defined accessibility as that which can be seen, reached, entered, and used, among others. Where the e-learning resources are accessible, there is need for utilization in other to accomplish the objectives of instruction.

Utilization of e-learning resources is the act of using e-learning resources in instructional communications. Utilization in the words of Hann (2017) is the extent to which a given group uses a particular thing within a specified period. Utilization in relation to this study is making use of available e-learning materials such as computer, laptop computer, palmtop computer, pocket computer, cellular phones, internet, e-mail, films, slides, robots, smart boards, hypertext and hypermedia among others in implementing Biology curriculum.

E-learning technologies have the potential to transform how and when learners learn. E-learning is accessed and delivered electronically with multimedia products. Institutions are now witnessing a paradigm shift from teacher-centred to learner-centred learning with the development of e-learning technology. The use of e-learning technologies reinforces the various teaching methods such as demonstration and discovery. According to United Nations Educational, Scientific and Cultural Organization (UNESCO, 2012) [11], meaningful teaching and learning in Biology must include diversification of concepts and methods promoting experimentation, innovation, the diffusion and storing of information. This diversification and innovation can be achieved with the effective use of e-learning resources.

Statement of the Problem

E-learning as a matter of fact is fast becoming popular in Biology education instructional delivery method, especially in secondary and tertiary institutions in Europe, America, and other developed and technologically advanced countries. In Nigeria, its usage as instructional method of teaching and learning in Biology education in secondary schools needs to be emphasized in line with what is obtained in other parts of the world. Pedagogic application of e-learning involves effective learning with the use of computer, printer, scanner, e-board, e-books, e-readers, CD-ROM, flash drives, modem, memory cards, camera, television, robots, hypertext and hypermedia, among others. Technologies such as e-learning necessitate and facilitate learning. E-learning is important in teaching biology as it helps in accessing high quality/up to date biology knowledge and modern equipment, enhancing competency of biology teachers and students, facilitating creativity/development of intellectuals collaboration and developing ICT skills as well as helps students and teachers develop advanced skills. However, there seem to be dearth of e-learning tools and technologies that are required for teaching and learning as well as poor utilization of the available ones. In addition, many teachers and students seem not to have the required skills and competency for utilization of e-learning resources. As a result, there seem to be dissatisfaction and challenge among teachers in the use of e-learning resources for curriculum delivery. Researchers reported that efforts has been made to solve this problem such as organizing seminars, workshops, conferences and in-service training yet the problem persists. This unfortunate situation is obviously a worrisome issue which necessitated the need to determine the extent of availability, accessibility and utilization, of e-learning resources in teaching Biology. This will fill the missing gap and streamline the use of e-learning technologies in curriculum delivery. It is against this background that the researcher had the curiosity to investigate the availability, accessibility and utilization of e-learning technologies in secondary schools in teaching Biology in Delta State.

Research Questions

The following research questions were raised to guide the study:

1. What are the e-learning resources available for the teaching of Biology in secondary schools in Delta State?
2. To what extent are the available e-learning resources accessible for teaching Biology in secondary schools in Delta State?
3. To what extent are the available e-learning resources utilized in teaching Biology in secondary schools in Delta State?

Hypotheses

The following null hypotheses will be tested at 0.05 level of significance

1. There will be no significant difference between public and private secondary schools on the extent of availability of e-learning resources for teaching Biology.
2. There will be no significant difference between public and private secondary schools on the extent of accessibility of e-learning resources for teaching Biology.
3. There will be no significant difference between public and private secondary schools on the extent of utilization of e-learning resources for teaching Biology.

Methods

The descriptive survey research design was adopted for the study. This study was carried out in Asaba and Agbor Education Zone of Delta State. The population of the study was made up of all the 431 Biology teachers in public (262) and private (169) secondary schools in Asaba and Agbor Education Zones in Delta State. There was no sample for the study as the population is of manageable size. Checklist and Questionnaire was used for data collection. The checklist list on Availability of E-learning Resources for Teaching Biology (CAERTB). The items were structured on a two-point rating scale of Available (A) and Not Available (NA). Section B was titled "Questionnaire on Extent of Accessibility of E-learning Resources for Teaching Biology" (QEARTB) while section C was title "Questionnaire on Extent of Utilization of E-learning Resources for Teaching Biology (QEUERTB). Both sections B and C have 4 point rating scale with response options as follows: Very High Extent (VHE), High Extent (HE), Low Extent (LE) and Very Low Extent (VLE). The instruments were face validated by four experts. Cronbach Alpha was considered appropriate in order to determine the internal consistency of the instrument. The co-efficient of reliability for the instrument was 0.87. Copies of the questionnaire were administered directly to the respondents by the researcher together with six research assistants who were secondary school Biology teachers. For research question 1 which centered on "Availability" of e-learning resources, the data collected was analyzed using frequency counts. For research questions 2, 3, 4, 5 and 6 which hinged on extent of accessibility and extent of utilization of e-learning resources, mean and standard deviation were used. The cut-off point for accepting degree of extent was 2. 50 and above for High Extent (HE) and below 2.50 for Low Extent (LE). In testing hypothesis I (Availability/checklist), the chi-square (χ^2) was used. For testing hypotheses 2 and 3, the t-test was used.

Results

Research Question 1: What are the E-learning resources available for the teaching of Biology in secondary schools in Delta State?

Table 1: Frequency Count and Percentage Rating of E-learning Resources Available for the Teaching of Biology in Secondary Schools in Delta State (N = 431)

S/N	Items	Avail (%)	Not Avail (%)	Decision
1	Computer	371	60	Available
2	Printers	297	139	Available
3	Scanner	307	124	Available
4	Modem	322	109	Available
5	Flash drive	389	42	Available
6	Memory Card	356	75	Available

7	Video clips	391	40	Available
8	Audio clips	130	301	Not Available
9	Video conferencing systems	87	344	Not Available
10	Teleconferencing devices	89	342	Not Available
11	Personal Digital Assistants (PDAs)	39	392	Not Available
12	Hard disk drives	259	172	Available
13	Android Phones	407	24	Available
14	Virtual Classroom	110	321	Not Available
15	Virtual Library	119	312	Not Available
16	Virtual Laboratory	111	320	Not Available
17	Digital Symbol Table (DST)	31	401	Not Available
18	Digital Spread Sheets (DSS)	114	317	Not Available
19	Digital Camera	112	319	Not Available
20	Digital Microscope	315	116	Available
21	Voice-over internet	78	353	Not Available
22	Software Packages	310	121	Available
23	Internet	317	114	Available
24	E-mail	320	111	Available
25	E-books	345	86	Available
26	E-readers	34	397	Not Available
27	E-white board	20	411	Not Available
28	Projectors	143	288	Not Available
29	Wi-Fi	268	163	Available
30	Bluetooth	251	180	Available
31	Youtube	112	319	Not Available
32	Podcasting	77	354	Not Available

From the findings of Table 1 above, items 1, 2, 3, 4, 5, 6, 7, 12, 13, 20, 22, 23, 24, 29 and 30 revealed that the respondents agreed that the above listed e-learning resources are available in their schools for teaching Biology while items 8, 9, 10, 11, 14, 15, 16, 17, 18, 19, 21, 26, 27, 28, 31, and 32 revealed that the E-learning resources were available in their various schools for teaching Biology but not sufficient. From the above analysis in Table 1, it is clearly stated that the E-learning teaching resources are available in schools as high number of the respondents indicated that there are biology teaching resources available in their school but not sufficient enough.

Research Question 2: To what extent are the available E-learning resources accessible for teaching Biology in secondary schools in Delta State?

Table 2: Mean Rating and Standard Deviation of Responses on Accessibility of E-learning Resources for Teaching Biology in Secondary Schools in Delta State (N = 431)

S/N	Items	Mean (x)	SD	Decision
1	Computer	3.46	1.08	Accessible
2	Printers	2.64	1.13	Accessible
3	Scanner	3.22	1.08	Accessible
4	Modem	3.15	1.12	Accessible
5	Flash drive	3.34	1.16	Accessible
6	Memory Card	2.56	1.20	Accessible
7	Video clips	2.74	1.21	Accessible
8	Audio clips	0.95	1.34	Not Accessible
9	Video conferencing systems	2.36	1.22	Not Accessible
10	Teleconferencing devices	2.42	1.20	Not Accessible
11	Personal Digital Assistants (PDAs)	0.94	1.31	Not Accessible
12	Hard disk drives	2.86	1.24	Accessible
13	Android phones	2.56	1.26	Accessible
14	Virtual classroom	2.42	1.20	Not Accessible
15	Virtual Library	2.23	1.28	Not Accessible
16	Virtual Laboratory	2.02	1.15	Not Accessible
17	Digital Symbol Table (DST)	1.57	1.26	Not Accessible
18	Digital Spread Sheets (DSS)	1.96	1.32	Not Accessible
19	Digital Camera	1.82	1.33	Not Accessible
20	Digital Microscope	2.07	1.26	Not Accessible
21	Voice-over internet	1.75	1.28	Not Accessible
22	Software packages	2.38	1.20	Not Accessible
23	Internet	1.16	1.28	Not Accessible
24	E-mail	2.16	1.24	Not Accessible
25	E-books	1.42	1.28	Not Accessible
26	E-readers	1.36	1.32	Not Accessible
27	E-white board	1.54	1.36	Not Accessible
28	Projectors	3.21	1.16	Accessible

29	Wi-Fi	3.26	1.14	Accessible
30	Bluetooth	3.44	1.16	Accessible
31	Youtube	1.01	1.34	Not Accessible
32	Podcasting	0.86	1.38	Not Accessible

Table 2 result shows that under the heading of accessibility of E-learning resources, out of 32 items, only 12 items of the E-learning resources are accessed for teaching Biology (1, 2, 3, 4, 5, 6, 7, 12, 13, 28, 29 and 30) with standard deviations of 1.08, 1.13, 1.08, 1.12, 1.16, 1.20, 1.21, 1.24, 1.26, 1.16, 1.14, and 1.16 respectively. The rest 20 items of E-learning resources are not accessed for biology instruction (8, 9, 10, 11, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 31 and 32) with standard deviations of 1.34, 1.22, 1.20, 1.31, 1.20, 1.28, 1.15, 1.26, 1.32, 1.33, 1.26, 1.28, 1.20, 1.28, 1.24, 1.28, 1.32, 1.36, 1.34 and 1.38. From the above analysis in Table 2, it is clearly stated that not all the available E-learning teaching resources are accessible for teaching biology in schools as higher percent of the respondents indicated that most of the available E-learning teaching resources for biology are not accessible in their schools.

Research Question 3: To what extent are the available E-learning resources utilized for teaching Biology in secondary schools in Delta State?

Table 3: Mean Rating and Standard Deviation of Responses on Utilization of E-learning Resources for Teaching Biology in Secondary Schools in Delta State (N = 431)

S/N	Items	Mean (x)	SD	Decision
1	Computer	3.56	0.84	Utilized
2	Printers	3.48	0.96	Utilized
3	Scanner	3.18	0.92	Utilized
4	Modem	2.98	1.12	Utilized
5	Flash drive	3.06	1.01	Utilized
6	Memory Card	2.65	1.22	Utilized
7	Video clips	0.86	1.38	Not Utilized
8	Audio clips	1.02	1.39	Not Utilized
9	Video conferencing systems	1.66	1.28	Not Utilized
10	Teleconferencing devices	1.42	1.28	Not Utilized
11	Personal Digital Assistants (PDAs)	2.38	1.20	Not Utilized
12	Hard disk drives	2.85	1.22	Utilized
13	Android phones	2.16	1.24	Not Utilized
14	Virtual classroom	2.32	1.26	Not Utilized
15	Virtual Library	1.28	1.27	Not Utilized
16	Virtual Laboratory	1.36	1.32	Not Utilized
17	Digital Symbol Table (DST)	2.17	1.34	Not Utilized
18	Digital Spread Sheets (DSS)	1.15	1.31	Not Utilized
19	Digital Camera	1.18	1.32	Not Utilized
20	Digital Microscope	2.07	1.36	Not Utilized
21	Voice-over internet	1.01	1.34	Not Utilized
22	Software packages	2.28	1.38	Not Utilized
23	Internet	0.86	1.38	Not Utilized
24	E-mail	0.64	1.36	Not Utilized
25	E-books	1.02	1.39	Not Utilized
26	E-readers	0.98	1.38	Not Utilized
27	E-white board	2.29	1.20	Not Utilized
28	Projectors	3.36	1.12	Utilized
29	Wi-Fi	3.26	1.14	Utilized
30	Bluetooth	3.21	1.16	Utilized
31	Youtube	1.76	1.28	Not Utilized
32	Podcasting	2.07	1.26	Not Utilized

Table 3 result shows that under the heading of utilization of E-learning resources, out of 32 items, only 10 items of the E-learning resources are utilized for teaching Biology (1, 2, 3, 4, 5, 6, 12, 28, 29 and 30) with standard deviations of 0.84, 0.96, 0.92, 1.12, 1.01, 1.22, 1.22, 1.12, 1.14, and 1.16 respectively. The rest 22 items of E-learning resources are not utilized for biology instruction (7, 8, 9, 10, 11, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 31 and 32) with standard deviations of 1.38, 1.39, 1.28, 1.28, 1.20, 1.24, 1.26, 1.27, 1.32, 1.34, 1.31, 1.32, 1.36, 1.34, 1.38, 1.38, 1.36, 1.39, m1.38, 1.20, 1.12, 1.14, 1.16, 1.28, and 1.26 respectively. From the above analysis in Table 3, it is clearly stated that not all the available E-learning teaching resources are utilized for teaching biology in schools as higher percent of the respondents indicated that most of the available E-learning teaching resources for teaching biology are not utilized in their schools.

Hypothesis 1

There will be no significant difference between public and private secondary schools on the extent of availability of e-learning resources for teaching Biology.

Table 4: Chi-Square Analysis of the Mean Rating of Respondents on the Significant Difference between Public and Private Secondary Schools on the Extent of Availability of E-Learning Resources for Teaching Biology

Factor	School Type	N	Mean	SD	X^2	df	P-value	Decision
Biology	Public	246	44.27	6.44	.65	429	.000	Not Sig
	Private	185	26.27	7.46				

Data presented in Table 4 shows the difference between public and private secondary schools on the extent of availability of e-learning resources for teaching Biology. The result of the chi-square analysis from Table 4 shows that the X^2 value is.485 and the P-value is.642. Since the P-value is greater than.001 level of significance at df of 2 and 429, ($x^2(429) = 0.65$, $p>0.000$). It shows that there is no significance difference between public and private secondary schools on the extent of availability of e-learning resources for teaching Biology. The null hypothesis is therefore accepted.

Hypothesis 2: There will be no significant difference between public and private secondary schools on the extent of accessibility of e-learning resources for teaching Biology.

Table 5: Independent t-test of the Mean Ratings of Respondents on the on the Significant Difference between Public and Private Secondary Schools on the Extent of Accessibility of E-Learning Resources for Teaching Biology

School Type	N	Mean	SD	df	t	P-value	Decision
Public	246	36.12	5.31	429	2.32	.024	Sig
Private	185	28.30	6.72				

The focus of Hypothesis 2 was to determine if there was significant difference in the mean ratings of respondents between public and private secondary schools on the extent of accessibility of e-learning resources for teaching Biology. Data in Table 5 reveal that p-value of 0.24 calculated at 0.05 level of significance and at 2 and 429 degree of freedom is less than.05. Since the p-value of 0.024 is less than the alpha level value of.05, the null hypothesis was rejected. Hence, there is a significant difference between public and private secondary schools on the extent of accessibility of e-learning resources for teaching Biology.

Hypothesis 3: There will be no significant difference between public and private secondary schools on the extent of utilization of e-learning resources for teaching Biology.

Table 6: Independent t-test of the Mean Ratings of Respondents on the on the Significant Difference between Public and Private Secondary Schools on the Extent of Utilization of E-Learning Resources for Teaching Biology

School Type	N	Mean	SD	df	t	P-value	Decision
Public	246	43.12	6.33	429	2.01	.001	Sig
Private	185	26.71	7.17				

The focus of Hypothesis 3 was to determine if there was significant difference in the mean ratings of respondents between public and private secondary schools on the extent of utilization of e-learning resources for teaching Biology. Data in Table 6 reveal that p-value of 0.001 calculated at 0.05 level of significance and at 2 and 429 degree of freedom is less than.05. Since the p-value of 0.001 is less than the alpha level value of.05, the null hypothesis was rejected. Hence, there is a significant difference between public and private secondary schools on the extent of utilization of e-learning resources for teaching Biology.

Discussion of the Findings

E-Learning Resources Available for the Teaching of Biology in Secondary Schools in Delta State

Findings from the study revealed that most of the e-leaning resources for teaching Biology in senior secondary schools in Delta State are not available. This shoes that the school administrators are yet to provide the required e-learning resources for teaching and learning. This findings is in agreement with the observations of Egbunonu (2008) and Gabadeen, Alabi and Akinnubi (2015) whose findings revealed that instructional resources for teaching are not available for use. The findings is also in consonance with the findings of Adika (2007); Ugwuanyi (2009) and Ofojebe (2013) whose studies revealed that there were no adequate resources available for teaching school subjects. Similarly, Ozovehe (2019) note that effective teaching and learning depends on the availability of suitable adequate resources such as books, library materials and host of other visual and audio teaching aids and classrooms.

The finding from hypothesis 1 also reveals that there is no significance difference between public and private secondary schools on the extent of availability of e-learning resources for teaching Biology. The null hypothesis is therefore accepted. Based on these findings, it would imply that the availability of instructional materials in schools in Delta state of Nigeria is still an issue of concern. It could be also deduced that the availability of e-learning resources cut across all subjects offered in Nigerian schools, not just biology.

E-Learning Resources Accessible for the Teaching of Biology in Secondary Schools in Delta State

Findings from the study revealed that e-learning resources available for teaching and learning of biology in secondary schools in Delta state are not accessible. The respondents asserted that there are no enough teaching resources available in their schools for teaching biology. E-learning resources are not easily accessible by the teachers during the teaching and learning processes of biology. The finding is in line with the findings of Obikeze and Onyechi (2011) whose study revealed that the e-learning resources are not accessed by teachers for teaching and learning biology. In agreement, Tukur, *et al* (2022) revealed in their study that the staff encountered some challenges while accessing and utilizing the information during the period that include time constraint, insufficient information richness of the alternative source compared to the internet, poor personal communication, inadequate information for preparing lecture note and inadequate information for research.

The findings in hypothesis 2 in Table 8 revealed that there is a significant difference between public and private secondary schools on the extent of accessibility of e-learning resources for teaching Biology. Based on these findings, it would imply that the accessibility of instructional materials in schools in Delta state of Nigeria is still an issue of concern. It could be also deduced that the accessibility of e-learning resources cut across all subjects offered in Nigerian schools, not just biology.

E-Learning Resources Utilized for the Teaching of Biology in Secondary Schools in Delta State

Findings from the study revealed that most of the available e-learning resources are not utilized for teaching and learning biology in secondary schools in Delta state of Nigeria. The instructional materials available are underutilized by biology teachers in secondary schools in Delta state. The finding is in agreement with the findings of Jegede and Owolabi (2008) who revealed in their study that 80% of the respondents indicated that they could not use or operate computers and online resources for learning. This finding was supported by the findings of Nwanna (2012) [9] who revealed that virtually all the learning resources were not available and as well not in use for teaching and learning purposes. Again, the findings of Wakili (2015) revealed that ICT learning resources are not available and at the same time not in use for teaching purposes in schools.

The findings in hypothesis 3 in Table 6 revealed that there is a significant difference between public and private secondary schools on the extent of utilization of e-learning resources for teaching Biology. Based on these findings, it would imply that the utilization of instructional materials in schools in Delta state of Nigeria is still an issue of concern. It could be also deduced that the utilization of e-learning resources cut across all subjects offered in Nigerian schools, not just Biology.

Conclusion

This study has examined the availability, accessibility and utilization of e-learning resources in teaching biology in secondary schools in Delta State, Nigeria. Based on the research findings of this study, it is concluded that some of the required e-learning resources to carryout effective teaching and learning of biology are fairly available while others are not. These fairly available e-learning resources are not regularly utilized by biology teachers. Based on the results of this study, the researcher concluded that the issue of availability, accessibility and utilization of e-learning resources for biology instruction in Delta state has not been properly addressed. The needed improvement in the quality of teaching and learning in our public and private schools can be achieved greatly if teaching strategy is enhanced through the utilization of e-learning resources. Therefore, to achieve the goals of biology education, all stakeholders (Government, Principals, teachers and students) should device very good strategies to ensure adequate provision, accessibility and utilization of e-learning for biology instruction in our schools.

Recommendations

The following recommendations were made among others:

1. Adequate e-learning resources should be provided for effective teaching and studying processes.
2. Instructional material is one of the major determinant of effective teaching and learning of biology in secondary schools which cannot be separated from teaching resources, it is therefore imperative to ensure they are made readily available during biology lessons by both the school head and the government as the case may be.
3. Teachers should be encouraged to access the available e-learning resources for effective teaching and studying processes.

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