

UTILIZATION OF INTERNET RESOURCES IN TEACHING AND LEARNING OF BIOLOGY IN SECONDARY SCHOOLS IN ENUGU EAST LOCAL GOVERNMENT AREA

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Abstract

The purpose of this study is to investigate the utilization of internet resources in teaching and learning of biology in senior secondary schools. The study was guided by three research questions, two hypotheses and it adopted the descriptive survey design. The population of the study consisted of 100 senior secondary students of Umuchigbo High school, Iji-Nike (henceforth referred to as UHSI) in Enugu East Local government Area of Enugu state. Purposive sampling technique was adopted to obtain the sample for the study. The instrument used for the study was questionnaire designed by the researcher which was validated by experts. Arithmetic mean was used as tool for analysis while t-test was used to test the hypotheses at .05 level of significance. Findings revealed that utilization of internet resources maximized students' engagement and enhanced their knowledge about biology. However, usage could be affected by students' lack of ICT skills and ICT resources being sources of distraction. Teachers' factors including lack of ICT skills, lack of adequately-trained biology teachers, high cost of data and limited support from the management as well as ignorance among biology teachers on the benefits of the use of Internet resources were limiting factors to utilization of internet resources. Findings also revealed that facility factors influenced utilization of internet resources among senior secondary school students. Such facilities include well-equipped ICT laboratory, computers and other devices as well as internet connectivity. Findings also showed that there was no significant difference between the mean response scores of students and teaches on students' factors that limit the utilization of internet resources in teaching and learning of biology in senior secondary schools in UHSI; and there was no significant difference between the mean response scores of students and teaches on teachers' factors that limit the utilization of internet resources in teaching and learning of biology in senior secondary schools in UHSI. Some recommendations were made: including government and school management board should provide computers and other internet resources to secondary schools; schools should organize trainings on digital skills acquisition for both teachers and students; schools should find a way to balance student freedom with administrative oversight over what students can and cannot access over the internet to avoid misuse.

Keywords; IT Resources, Biology, Teaching, Learning, Utilization, Digital skill.

Introduction

Biology is a science subject taught from senior secondary school level and one of the most essential science subjects in Senior Secondary Schools in Nigeria. It is the study of life which also describes how living organism functions evolve and interact with their environment. Ibrahim (2023) posits that biology prepares students for career in basic sciences and other areas of discipline. Today in Nigeria, many biology teachers and students complain mainly of lack of instructional/Educational materials for effective teaching and learning of biology. Most biology students perceive the subject to be too wide, difficult to understand and the textbooks also too difficult to read and comprehend. This has contributed to poor result among the biology students both in their internal and external examination.

The main aim of Educational sectors is equipping future workers with necessary skills (Lawler, 2016). Most biology teachers are ignorant of how to source for ICT materials to enhance their teaching of biology. They are ignorant of the powerful tool that are available to them which can help them access

information about the subject. Rather they only depend on the use of textbooks within their reach without being aware of the importance of internet resources to teaching and learning. Others lack necessary skills on how to engage the internet and access all the benefits it has to offer them. If the above situations are not taken care of, it will generally affect the improvement of the academic achievement of biology students especially in the senior secondary level.

Purpose and objective of the Study

The purpose of this study is to investigate the utilization of internet resources among senior secondary school teachers/ students in teaching and learning of biology. In order to present a comprehensive study, the focus is on Umuchigbo High School Iji-Nike, Enugu East Local Government Area of Enugu State. Specifically, the objective of the study is to identify the following;

1. Student factors that limits the utilization of internet resources in teaching and learning of biology in senior secondary schools in Umuchigbo High School, Iji-Nike, Enugu State.
2. Teacher factors that limits the utilization of internet resources in teaching and learning of biology in senior secondary schools in Umuchigbo High School, Iji-Nike, Enugu State.
3. Facilities factor that limits the utilization of internet resources in teaching and learning of biology in senior secondary schools in Umuchigbo High School, Iji-Nike, Enugu State.

Research Questions

In order to proffer solutions to the above objectives, the following research questions are formulated;

1. What are the student factors that limit the utilization of internet resources in teaching and learning of biology in senior secondary schools in UHSI, Enugu State?
2. What are the teacher factors that limit the utilization of internet resources in teaching and learning of biology in senior secondary schools in UHSI, Enugu State?
3. What are the facilities factor that limits the utilization of internet resources in teaching and learning of biology in senior secondary schools in UHSI, Enugu State?

Research Hypothesis

Hypothesis One

Null hypothesis (H_0): There is no significant difference between the mean scores of student and teachers on the student factors that limit the utilization of internet resources in teaching and learning of biology in senior secondary schools in UHSI.

Hypothesis Two

Null hypothesis (H_0): There is no significant difference between the mean scores of student and teachers on the teacher factors that limit the utilization of internet resources in teaching and learning of biology in senior secondary schools in UHSI

Literature Review

Theoretical Review/framework

Connectivism Theory

This theory was created in 2005 by two theorists George Siemens and Stephen Downes who believes that technology has changed the way we receive information, thus changing the way we learn. Connectivism was introduced as a learning theory based on the premise that knowledge exists in the world rather than in the head of an individual. It identifies and remedies knowledge and it is connected to the technology age. Connectivism sees learning as the process of creating connections and developing a network. The learning theory suggests that students should combine thoughts, theories and general information in a useful manner. Connectivists accept that technology is a major part of the learning process and that our constant connectedness gives opportunities to make choices about our learning. It focuses on learner's ability to frequently source and update accurate information (Mathew, 2018).

Principles of connectivism learning theory

George Siemen developed this learning theory by mapping out the following eight guiding principles:

1. Learning and knowledge rest in diversity of opinions: Perspectives from varieties of sources deepens learners understanding.
2. Learning is a process of connecting: when we build relationship with people and colleagues, it opens us up to skills, thought, and ideas we might not otherwise have access to.
3. Learning may reside in non-human appliances: learners through social media post, video, an app etc. may store in digital way. Also a community of learners may store information in a forum or database,
4. The capacity to know more is more critical than what is currently known: According to Siemens, our ability to learn what we need for tomorrow is more vital than what we know today.
5. Nurturing and maintaining connections is needed to facilitate continual learning: collaborative social interaction helps in forming a long-term learning environment and also bring people together.
6. Ability to see connections between fields, ideas, and concept is a core key.
7. Accurate up-to-date knowledge is the intent of all connectivism learning: Our understanding is constantly reinforced and updated when we work together.
8. Decision-making itself is a learning process and what we know today may change tomorrow: (Afro, 2023): it is important to understand that our knowledge will need to continuously evolve as new ideas presents themselves

Connectivism accepts technology as a major factor in our learning process. The theory promotes the idea that learning can successfully happen through different channels including videos, images, social media, blogs, forums etc. This can include actions such as googling a question, searching for a topical social media content or texting a friend. The theory posits that the use of technology help solves a problem and in turn deepens understanding of a topic. Bell in Dorathy, (2013) referred to connectivism as an instructional theory which recommends the use of learning materials, resources or situations to help individual learn through instructional strategies used by the teachers aimed to motivate students to learn and think higher. Archana, 2018 Posited that students have shown considerable interest in more participatory and interactive technologies more than in the traditional content delivery tools. Technology that enhanced learning has increased in recent years (Buchanan, Joban, and Porter, 2014)

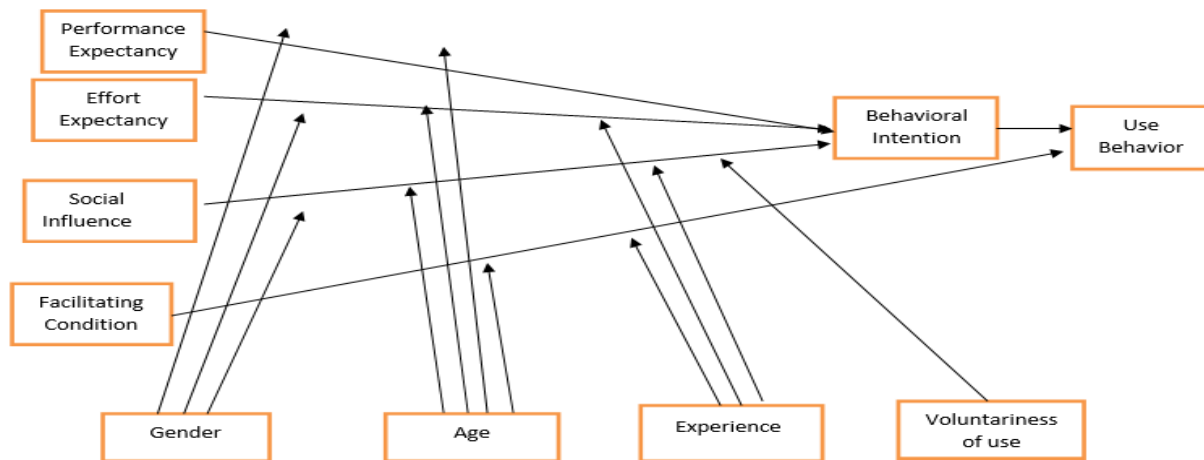
Therefore, this learning theory should be inculcated in the teaching and learning of biology to deepen the learners' knowledge on the subject and improve their academic performance. This theory is related to this study because the theory promotes the idea that learning can successfully happen through different channels which includes the use of video clips, video games, virtual field trips, images and other IT resources.

Unified Theory of Acceptance and Use of Technology UTAUT

This theory was initially proposed by Venkatesh et al in 2023 and subsequently revised by Rana and Weerakkody in 2017. The theory has been widely used by researchers to explain the acceptance and use of information systems and technology. The UTAUT incorporates elements from eight individual models, including "The Theory of Planned Behavior, Theory of Reasoned Action, the Social Cognitive Theory, the Technology Acceptance Model, the Model of Personal Computer Utilization, the Diffusion of Innovation Theory and the Motivational Theory. UTAUT consolidate various models of technology adoption to provide a more comprehensive understanding of how users accept and use technology. This information system models have been found to explain a significant amount of variability in the behavioural intention and usage behavior of technology. The theory consists of four main constructs which includes social influence, performance expectancy, facilitating conditions and effort expectancy. These constructs are believed to influence the user's intension to use the technology which in turn will affect their usage behavior. Facilitating conditions are assumed to have positive relationship with technology usage and a direct influence on its use. This theory was used by Ibrahim, 2023 in his study to investigate biology teachers' perception and use of information and communication technology for teaching and learning. This theory is use in this study because it serves as a baseline model to examine the research problem in this study. It is also an appropriate tool to identify critical factors and the

perception of biology teachers and students in public secondary schools in Enugu Education Zone on the use of IT resources.

Figure1: Unified Theory of Acceptance and Use of Technology UTAUT



Source: Ibrahim, 2023.

Though the Unified Theory of Acceptance and Use of Technology UTAUT does not assume that attitudes towards the use of technology has a direct effect and impact on the intention towards the learners, the theory is still regarded as relevant for the purpose of this study despite this limitation.

Gardner's Theory of Multiple Intelligences

The concept of multiple intelligences is a theory proposed by Harvard Psychologist Howard Gardner. He first outlined his theory in his 1983 book titled; *Frames of mind: Theory of multiple Intelligences* where he suggested that all people have different kinds of intelligences rather than defining intelligences as a single term and ability. He proposed that there are eight intelligences in order to capture the full range of abilities and talents that people possess (Cherry, 2023).

These eight intelligences are:

1. Visual – spatial: This deals with spatial judgment and the ability to visualize with the mind's eye.
2. Linguistic – verbal: People with this ability display a facility with words and languages. They are typically good at reading, writing, telling stories and memorizing words with dates.
3. Logical – mathematical: This has to do with logic, abstractions, reasoning, numbers and critical thinking.
4. Body – kinesthetic
5. Musical
6. Interpersonal
7. Intrapersonal
8. Naturalistic

A person may have one or combination of these intelligence. Even though there are criticisms against this theory, that is, it suffers from a lack of supporting empirical research. The theory, however, enjoys considerable popularity with educators. Teachers are utilizing multiple intelligences into their teaching in the classroom.

The use of multiple intelligences has come to play especially with recommendations that teaching styles be individualized to suit the most effective method for each student as well as be pluralized (teaching important materials in multiple ways). Most schools still use the traditional method of instruction –

talking to a group of pupils in the classroom. By this method, pupils are taught the same thing in the same way and at the same time.

It ignores the fact that students differ from each other in their interest the way they learn and their rate of learning, but individual differences among learners must be recognized. The use of IT resources in teaching and learning of biology makes this possible. Use of computers and other IT based resources do not mean that computers can replace teachers, but they can have specific uses in a classroom and or laboratory and may be successfully integrated in teaching and learning processes (Isvoran et al, 2016).

The Use of Gardner's Theory in the Class

The use of computers allows teachers to integrate the multiple intelligences theory in their classroom, assuring the participation of the biggest part of the students to the lesson. Each pupil is unique. While pupils thrive in certain learning environments, they struggle in others. Teachers can use multiple intelligences in the classroom for the benefit of their students by customizing lessons, classroom layouts, and assignments for these multiple intelligences. Teachers should teach in a way that supports all types of intelligence, not just the traditional ones such as linguistic and logical intelligence.

Empirical Studies

A number of researches have been carried out on various areas related to these studies. The empirical studies are reviewed as follows:

Ihejiamaizu and Ochui (2019) investigated the utilization of electronic instructional material, on senior secondary school three (SS3) biology in Calabar Education zone, Cross River, Nigeria. The work adopted ex post facto-research design and a sample of 490 students was used for the study. A checklist and achievement test were instrument used for data collection. Data generated were analyzed using one way analysis of variance and tested at 0.5 level of significance. The findings showed that the utilization of electronic instructional material significantly influence students' academic achievement in biology. Consequently, the researchers recommended that government should ensure distribution of electronic type of instructional materials to all public senior secondary schools in the education zone to enhance teaching and learning of biology. This study is related to the researcher's work because Electronic Instructional Materials is part of Information Technology Resources and it also talks about the influence on students' academic achievement in Biology subject. They, however, differ in their research design and in the areas of studies since the former was conducted in Cross River state but the later was conducted in Enugu State.

Ajemba, Ahmed, Ogunodu and Aiyedun, (2021) in their studies on the use of instructional material also stated that the quality of education that a student receives depends largely on the quality of the teaching/learning resources provided. This means that student learn fast when different instructional materials are applied in the implementation of the teaching.

Study conducted by Ezechi (2018), titled the influence of field trip in teaching and learning of biology in Enugu East LGA of Enugu state, Nigeria. Three research questions guided the study. Survey design was used for the study. The sample size was one hundred (100) senior secondary school II (SS2) students. The instrument used for data collection was questionnaire made up of 15 items. The instrument was validated by three experts. The reliability coefficient of 0.79 was obtained for the instruments using cronbach alpha. The findings revealed that teachers use field trip once a year and that some teachers do not use it all in teaching and learning of biology. The findings also revealed among others that field trip is an effective method of teaching since it helps students acquire useful knowledge while having fun and relaxation at the same time. The researcher recommended that extensive field trip should be organized by schools so as to expose the students to events outside the classroom. Hence, with the use of IT resources through virtual trip biology students can also be exposed to field trip and have first-hand experience which will help enhance their understanding in the concept being taught. This study is related to the present study because it sought to find out ways to help enhance students understanding in biology concept and they both adopted a survey research design. However, they differ in their research topic.

Babalola, (2010) investigated the functionality of modern communication technology assisted instructions for teaching in public colleges of education in south east for achievement of quality instruction output. Five research questions and one null hypothesis guided the study. The research adopted a description survey design. Seven public owned colleges of education in south east Nigeria constituted the population which comprises of three federal and four state college. This research work is related to the present topic because they both talk about the use of modern communication technology for teaching and learning with use of the same research design. The difference is that this study was carried out in college of education in south east while the present study focuses on biology students in senior secondary school in Enugu Education Zone.

Schneider (2011) defined educational technology as “the ethical practice of facilitating learning and improving performance by creating, using and managing appropriate technology processes and resources. It was further explained as an array of tools that might be proven helpful in advancing students’ performance.

Lumen (2005) stated that computers displaying visualization and activities on a projection screen can be used to illustrate and explain concepts in biology. According to Krulike (2010), it can mean mimicry, making working replica or representation for demonstration or analysis of problems that clearly illustrates real life or hypothetical situations. Computer simulation therefore permits the learner to manipulate variables or parameters and then to observe the consequences of their choices.

Honey (2001) as cited in Jonassen, Howaland, More and Rose (2023), stated that the proper software questions in a subject can be repeated in many ways until student’s masters the content. Hence, the use of computer assisted instructions in the teaching of biology is appropriate, since the subject involves many complex phenomena that students with special needs may have problems comprehending.

Murphy (1995) in his study used a population of 1700 academic staff members of colleges. Through stratified random sampling, he obtained a sample of 170 academic staff members, representing 10% of the population. A structural questionnaire was used to obtain the option for academic staff in the selected colleges. The instruction was validated by three experts and t-test statistics was for reliability, Cronbach alpha of 0.83 was established which suggested acceptance. The finding shows that teachers’ utilization of modern technology assisted instruction for personal research and academic enhancement, but little was practiced in classroom teaching. There was poor learning due to inadequate equipment. This hampers students’ manipulative skills in accessing modern educational technologies. Recommendations were made for adequate funding by government to help achieve instructional objectives in teaching and learning process.

Abanikannda, MutahirOluwafemi 2018 conducted a study to investigate the effect of technology tools on Osun state high school on students’ interest in Biology. A descriptive survey method was used for this study. Three hundred science students selected from ten high schools in Osun state were sampled in this study. A self-designed questionnaire was used for data collection. Data collected were analyzed using appropriate descriptive statistics. Findings revealed that: students make use of technology tools for learning in high schools which influence their interest in learning Biology but technology tools for learning Biology are scarce. The study concluded that few students make use of technology tools in learning Biology in high schools and these technology tools influence students’ interest in learning Biology. Based on the findings, the study recommends government and other stakeholders in education to provide support in the use of technology in teaching and learning process in schools to enhance performance. The study is related to the current research because they both focus on the use of technology in teaching and learning of biology and its influence on students’ interest in learning of Biology. The difference in the two research work is that the former was conducted in Osun State while the later was carried out in Enugu state.

Uzezi (2021) carried out a descriptive survey on the availability, adequacy and effective utilization of ICT resources by practicing pre-service science teachers in secondary schools in Jalingo metropolis, Taraba State, Nigeria. She used ten secondary schools and 103 teaching practice science teachers and

data were collected through the use of questionnaire. The researcher found out that there was poor utilization of ICT resources in secondary schools in Jalingo Metropolis; there was a high positive correlation between availability and utilization of ICT resources; and also there was a high positive correlation between adequacy and utilization of ICT resources. The researcher recommended that Taraba State Ministry of Education should perform an audit of school ICT resources to ensure that ICT facilities are available to a good standard across all schools in the State for effective use by science teachers. This study is related to the present research work because they both emphasize on the need for the use of technology by teachers in giving out instructions. However, the current work focus mainly on biology teachers and senior secondary biology students in public schools in Enugu Education Zone while the later was carried out in Jalingo Metropolis in Taraba state among teaching practice science teachers and science students.

Ihejiamaizu and Ochui (2019) investigated the utilization of electronic instructional materials on secondary school three (SS3) biology students in Calabar, Education Zone Cross River State, Nigeria. The researchers adopted Expost facto-research design and used a sample of 490 students. A checklist and achievement test were instruments used for data collection. The results of their work showed that utilization of electronic instructional materials significantly influenced students' academic achievement in biology. They recommended that government should distribute electronic types of instructional materials to all public secondary schools presenting candidates for SSCE and NECO to enhance effectual teaching and learning of biology. The study is related to this present work because both talks about the use of instructional materials biology student and its influence on academic achievement in biology. The difference is that the current work adopted a descriptive survey research design while the later adopted Expost-Facto research design and their area of study are not the same.

Further, Arome, Mercy, and Idris (2022) carried out a descriptive research on the impact of the internet use on Biology students' academic performance in Zaria, Kaduna State. They raised three research questions and formulated three research hypotheses. Their sample consisted of 351 respondents and data were collected through the use of titled "Impact of Internet Use on Biology Students' Academic Performance (IIUBSAP)." Their findings revealed that students in public secondary schools in Zaria, Kaduna State have significant reasons for using the internet; that internet-based technologies have an impact on academic performance of Biology students; and there were no substantial differences in too much online activity among Biology students based on gender. The researchers recommended that Biology students in Zaria, Kaduna State should exclusively use the internet for instructional purposes. This study is related to the present research because it sought to determine the impact of internet use which is part of IT resources on biology students. However they differ in the area of study since the former was conducted in Kaduna state while the later focuses on Enugu state.

Ibrahim, H. O. (2023), using descriptive survey design, carried out a research on biology teachers' perception on availability and utilization of information and communication technology for teaching and learning biology in public senior secondary schools, Kwara state. He raised three research questions and formulated three null hypotheses. He used 50 biology teachers and data collected were through the use of questionnaire. The researcher found that information and communication technology devices were not adequately available and utilized for teaching and learning of biology; the use of ICT in teaching biology could make learning more effective and improve the performance of students in biology examinations in Kwara State. The author recommended that there should be adequate provision of ICT devices and necessary infrastructural facilities for its use in schools. This study is related to the present work because they both seek to find out the extent to which IT resources is available for teaching of biology. The have slight difference in terms of location since the former was carried out in Kwara state while the later was conducted in Enugu state.

Bayuo, Abukari, Bornaa, Samari, and Alagbela (2022) carried out a research using a cross-sectional survey design on the potential of ICT in the teaching of chemistry at Senior High Schools (SHSs) in Ghana. Their sample consisted of 30 teachers. The study found that though science teachers were competent in using ICT tools in teaching and learning activities, however, utilization of ICT was considered low. Also, the utilization of ICT tools in teaching chemistry was confronted with factors

which hindered their effective utilization. These factors included teacher-related factors, cost-related factors, technological-related factors, management and leadership-related factors, and environmental-related factors. The researchers recommended that the Ministry of Education should ensure that adequate and appropriate ICT resources and facilities were provided for use. This research is related to the present study because both result revealed that the utilization of IT resources in teaching was to some extent very low. But they both differ in the area of the study as the present was conducted in Nigeria while the former was conducted in Ghana, also the former investigated on the utilization of ICT tools in teaching chemistry using a cross-sectional survey design while the current researcher investigated on the Integration of IT resources in teaching and learning of biology using a descriptive survey design.

Belay, Khatete, and Mugo, (2020) carried out a descriptive survey research to determine the availability of ICT resources for teaching and learning Biology in secondary schools in the Southern Region, Eritrea. The sample of their study consisted of 12 school directors, 34 Biology teachers and 175 grade eleven students from 12 public schools. Data were collected using questionnaires, interview and observation schedules. Results of the study indicated that most of the sampled schools had inadequate ICT resources like computers, computer laboratories, projectors, televisions, video players, digital content, and the internet. These resources were not enough or available for use by Biology teachers in teaching and learning. The researchers recommended that the adequate ICT resources should be provided in schools for teaching and learning Biology and other subjects. Both the current and former research work sought to find out the availability of the resources for carrying out instruction in teaching and learning of biology with the same research design. However there is a slight difference in their location.

Ojelade, Aregbesola, Ekele and Aiyedun (2020) carried out their research using a pre-test, post-test quasi-experimental design. They worked on the effects of audio-visual instructional materials on teaching science concepts in secondary schools in Bwari Area Council, Abuja, Nigeria. They raised two research questions and formulated two hypotheses. The sample of the study comprised one hundred students and data were collected using Science Achievement Test (SAT). Their findings showed that audio-visual instructional material had a significant effect on students' achievement in sciences; the use of audio-visual instructional material enhanced the effectiveness among male and female students learning science without gender disparity. The researchers recommended that teachers should incorporate the use of appropriate audio-visual instructional materials when teaching their students.

Ibe, and Abamuche (2019) carried out quasi experimental research design on the effects of audiovisual resources on teaching and learning of biology. They used a sample of 150 senior secondary two (SS2) students of two intact classes randomly selected from two schools. The researchers divided the class into two groups, one serving as the experimental and the other as the control. The experimental group received biology lesson with the aids of audiovisual resources while the control did not. Result revealed that the group exposed to lessons with audiovisual technological devices achieved higher in test scores than the group not exposed to. It was recommended that classroom teachers keep pace with development trend by learning and using audio-visual in instructional delivery.

Edache-Abah and Ekinah(2021)in their study using descriptive survey investigated the impact of ICT on teaching and learning of biological concepts among post graduate students in Rivers State. They raised three research questions. The sample consisted of thirty (30) lecturers and seventy (70) students in the Biological Science Department in the universities in Rivers State. The instrument for data collection was a questionnaire. The result indicated that ICT was relevant to the teaching and learning of Biological concepts with 27.8% of respondents agreeing to a great extent, 41.1 % agreed to a considerable extent and 31.1 % agreed to a moderate extent. The result also shows that21.1% agreed to a great extent, 33.3 % reacted to a considerable extent, 36.7% believed to a moderate extent, while 8.9 % agreed to a low extent or not at all that lecturers use ICT in the teaching. Further, result also shows that 35% agreed to a great extent, 32% agreed to a considerable extent, 25% agreed to a moderate extent, while 8% low extent that students do have relationship with the ICT in enhancing their knowledge and understanding of Biological Concepts. The researchers recommended that lecturers should utilize ICT

facilities for the post graduate students; students should learn the use of ICT facilities so as to benefit from them. Finally, educators should blend their teaching of curriculum contents, using ICT facilities. This very work is related to the current study because both research work reveal the relevance of IT resources in teaching and learning of biology. However the present research work was conducted among biology teachers and students in senior secondary school in Enugu state but the former was carried out among post graduate students and their Lecturer in Rivers State.

Salman and Habeeb (2017) carried out a descriptive research on the teachers' proficiency with respect to the usage of ICT for teaching senior school Biology in Ilorin, Nigeria. The researchers raised three research questions and data were collected through the use of questionnaire. The sample consisted of 80 biology teachers. The study revealed that proliferation of technologies has complicated the teaching-learning process and finding the best ways of integrating technology into classroom practices is one of the challenges the 21st century teachers face. Therefore, biology teachers should be able to identify and articulate a vision, provide an appropriate model, provide individualized support, provide intellectual stimulation, foster acceptance of group goals, and achieve high performance. Recommendations were made, including governments should improve the training of principals, teachers and computer personnel on the use of ICT devices through seminars, workshops and in-service training; and emphasis should be aimed at developing a long term program effective for continuous commitment to training and use of instructional technologies.

Mutazu (2021) as cited in Mutazu (2022) posits that meaningful teaching and learning can only be attained when there is appropriated and efficient availability and utilization of both human and natural resources.

Yebowaah (2018) looks at the impact of technology usage in Nigeria senior secondary school students and found out that public schools use technology at a lesser rate than other schools in developed countries.

Summary of Literature Review

Information technology integration involves the use of computer, projector devices, television, radio and other IT facilities to enhance teaching and learning for better and deeper understanding of the concept being taught. These IT tools are being use by teacher to provide student with simple practice and even more media for cultivating student's critical thinking and complex thoughts. The use of IT resources provide students with high quality learning, challenges students' efforts when aiming for certain targets and increases their motivations and drive.

From the review of the literature above, it is obvious that studies have been done on the area of IT Resources in teaching and learning of biology generally. But to the best of the researcher's knowledge, no work have been done on the Integration of IT Resources in teaching and learning of biology in Enugu education Zone, specifically in Umuchigbo High School, Iji-Nike, Enugu. This is the academic gap this study set out to fill. In addition, this current research will add to the body of knowledge already acquired and to the existing literature.

Research Method

The study adopts a descriptive survey design because descriptive research involves collecting data to test hypothesis or answer research question concerning the current status of the subject of studies (Emeritus, 2021). Population of the study consisted of 651 biology senior secondary students (SS1, SS2 and SS3 students) and 5 biology teachers of Umuchigbo High School, Iji-Nike, Enugu state. Out of the student's population, a purposive sample of 100 students was used, representing 15.4% of students' population. This number was divided proportionately among the three levels as follows: SS1 (39); SS2 (41); SS3 (20)

The number of biology teachers was 5. It was manageable and constituted the sample size for the teachers. The sample for the research, therefore, constituted of 105 respondents, that is, 100 biology students and five biology teachers. A structural questionnaire developed through review of literature

was used in the research. 105 questionnaires were distributed to the students and teachers. Validation was done by experts in the field and their corrections were taken into consideration before producing the final copy of the questionnaire. The questionnaires were shared fairly and randomly among the correspondents as shown in the table below. The students and teachers registered their degree of agreement to the items on the instrument of data collection (questionnaire). The researcher organized the data using frequency tables for data analysis, while the mean and standard deviations of the scores were calculated and utilized to answer all research questions.

Results

The results of the study are hereby presented according to the research questions that guided the studies

Research Question 1: What are the student factors that limit the utilization of internet resources in teaching and learning of biology in senior secondary schools in Umuchigbo High School, Iji-Nike, Enugu state?

Table: Student factors that limit the utilization of internet resources in teaching and learning of biology in senior secondary schools

S/n	Statement	Students n=100			Teachers n = 5		
		X ₁	SD ₁	Dec. ₁	X ₂	SD ₂	Dec. ₂
1.	Lack of interest among biology teachers and students in using IT resources for teaching and learning of biology subject.	3.00	0.98	Agree	3.40	0.89	Agree
2.	Lack of ICT skill among biology students limits the effective use of internet resources in the teaching and learning of biology.	3.14	0.89	Agree	3.40	0.89	Agree
3.	Ignorant among students to the benefits of the integration of IT resources in secondary schools.	2.96	1.03	Agree	3.80	0.45	Agree
4.	Playing games, watching videos, chatting and other forms of distractions from non-educational contents can hinder effective use of the internet resources.	3.31	0.77	Agree	3.80	0.45	Agree
	Overall	3.10	0.92	Agree	3.60	0.67	Agree

From the above table, the respondents agree with all the items in Research Question 1. The overall mean scores of (\bar{x} = 3.10 and 3.60 respectively) for both biology students and their teachers indicate that they agree that student factors limit the utilization of internet resources in teaching and learning of biology in senior secondary schools.

Hypothesis Testing

Hypothesis One

Table: t-test Analysis of student factors that limit the utilization of internet resources in teaching and learning of biology in senior secondary schools

Group	N	Mean	SD	Df	t-cal.	t-crit.	Remark
Students	100	3.10	0.92	103	1.28	1.65	Accept H ₀
Teachers	5	3.60	0.67				

The calculated t-value of 1.28 is less than the critical t-value of 1.67 at degree of freedom 103 and .05 alpha level. The null hypothesis which states there is no significant difference between the mean response scores of students and teachers on students' factors that limit the utilization of internet resources in teaching and learning of biology in senior secondary schools is accepted.

Research Question 2: What are the facility factors that limit the utilization of internet resources in teaching and learning of biology in senior secondary schools in Umuchigbo High School, Iji-Nike, Enugu state?

Table: Facility factors that limit the utilization of internet resources in teaching and learning of biology in senior secondary schools in UHSI.

S/n	Statement	Students n=100			Teachers n = 5		
		X ₁	SD ₁	Dec. ₁	X ₂	SD ₂	Dec. ₂
5.	Lack of well-equipped laboratory will hinder effective use of internet resources in teaching and learning of biology.	3.57	0.61	Agree	3.80	0.45	Agree
6.	Lack of adequate power supply will hinder effective use of the internet resources.	3.59	0.53	Agree	4.00	0.00	Agree
7.	Poor internet connectivity to access the internet during lessons can hinder the effective use of the internet resources.	3.43	0.79	Agree	4.00	0.00	Agree
8.	Limited digital content in school curriculum negatively affect.	2.77	1.09	Agree	3.20	0.84	Agree
9.	Inadequate use and access to computer and their devices will hinder the teaching and learning of biology?	3.32	0.76	Agree	3.80	0.45	Agree
	Overall	3.34	0.76	Agree	3.76	0.35	Agree

According to the table above, the respondents agree with all the statements on facilities factors that can limit the utilization of internet resources in teaching and learning of biology in senior secondary schools in UHSI. Further, the overall mean were $x = 3.34$ for biology students and $x = 3.76$ for the biology teachers, indicating that they agreed that facilities factors limit the utilization of internet resources in teaching and learning of biology in senior secondary schools in UHSI.

RESEARCH QUESTION 3: What are the teachers' factors that limit the utilization of internet resources in teaching and learning of biology in senior secondary schools in Umuchigbo High School, Iji-Nike, Enugu state?

Table: Teachers' factors that limit the utilization of internet resources in teaching and learning of biology in senior secondary schools in UHSI?

S/n	Statement	Students n=100			Teachers n = 5		
		X ₁	SD ₁	Dec. ₁	X ₂	SD ₂	Dec. ₂
10.	Lack of adequately trained/skilled biology teachers for effective use of IT resources in teaching of biology subjects.	3.29	0.80	Agree	3.40	0.89	Agree
11.	Lack of internet literacy among teachers contributes to poor teaching and learning of biology.	2.88	1.09	Agree	2.80	1.30	Agree
12.	High cost of data and limited support from the management to buy data can hinder effective use of the internet resources	3.42	0.65	Agree	3.80	0.45	Agree
13.	Ignorance among biology teachers to the benefits of the integration of IT resources in secondary schools	2.65	1.12	Agree	3.80	0.45	Agree
	Overall	3.06	0.92	Agree	3.45	0.77	Agree

In the table shown above, the respondents agree with all the statements on teachers' factors that can limit the utilization of internet resources in teaching and learning of biology in senior secondary schools in UHSI. Further, the overall mean $x = 3.06$ for biology students and $x = 3.45$ for their teachers indicate that they agree that teachers' factors do limit the utilization of internet resources in teaching and learning of biology.

Hypothesis Testing

Hypothesis Two

Table: t-test analysis of teachers' factors that limit the utilization of internet resources in teaching and learning of biology in senior secondary schools in UHSI.

Group	N	Mean	SD	Df	t-cal.	t-crit.	Remark
Students	100	3.06	0.92	103	0.894	1.67	Accept H_0
Teachers	5	3.45	0.77				

The calculated t-value of 0.894 is less than the critical t-value of 1.67 at degree of freedom 103 and .05 alpha level. The null hypothesis which states there is no significant difference between the mean response scores of students and teachers on teachers' factors that limit the utilization of internet resources in teaching and learning of biology in senior secondary schools in UHSI is accepted.

Discussions

The findings of the research work are hereby presented and discussed:

Research Questions 1 – 4 show student factors that can influence utilization of internet resources among senior secondary schools. The study also shows that use of internet resources will maximise students' engagement in learning of biology and also enhance their knowledge about the subject. However, lack of ICT skills among the students limits the effective use of internet resources. Again, internet resources can be a source of danger and distraction. The findings are in line with observations. There are many advantages of using internet resources in teaching and learning of biology. Because internet resources provide concrete experience to the learner they therefore arrest the attention of the students, making them active, alert and engaged in teaching and learning of biology. Engagement subsequently leads to acquisition of knowledge. Lack of interest has been linked to low motivation and poor academic performance among students (Agbulu and Wever, 2011).

However, for students to enjoy the benefits of internet resources they have to be ICT literate. This is, therefore, a great factor to consider. The use of internet resources opens students to potential dangers. They can fall victim to internet predators or become the target of cyber bullying while on the internet. Again, computers provide the learners with temptations like playing games, watching videos or chatting. Finally, further analysis shows there is no significant difference between the mean response scores of students and teachers on students' factors that limit the utilization of internet resources in teaching and learning of biology in senior secondary schools in UHSI. This implies that both students and teachers equally agree that students' factors limit the utilization of internet resources in teaching and learning of biology.

Research Questions 5 – 9 show that facility factors can influence utilization of internet resources among senior secondary school students. Such facilities include well equipped ICT laboratory, computers and other devices as well as internet connectivity. Is Nigeria really ready for technology in communication? This question is important because of lack of internet resources are often noticed in Nigerian schools. These facilities include computers, overhead projectors, televisions, videos, satellite systems, communicating devices, routers, modems, fibre optic, and video conferencing devices. Sometimes, the speed of internet connection is slow, slowing access to the internet. The work of Bawa (2016) on some secondary schools in Kebbi state, Nigeria revealed that there was significant difference in the academic performance of the students taught using computers and those taught using conventional instruction. Bawa's research agrees with the works of Isola (2010), Oladajo, Olosunde, Ojebisi, and Isola (2011) and Abdu-Raheem, (2011).

Further, Research Questions 10 – 13 show teachers' factors that can influence utilization of internet resources among senior secondary school students. They include lack of internet literacy and proficiency in its use. The teacher by his profession has received the requisite skills to impact knowledge to the learner. When such skills are lacking it is very obvious that no knowledge will be transferred.

Utilization of internet resources is a sign of modernity where traditional teaching and learning is giving way to new methods. Teachers should possess required digital skills to cope with the demands of the new world of learning. There is a positive correlation between qualification of the teacher and student's academic performance (Adedoyin, 2011; Daso, 2013).

Further analysis of the study revealed that the null hypothesis is accepted. There is no significant difference between the mean response scores of students and teachers on teachers' factors that limit the utilization of internet resources in teaching and learning of biology in senior secondary schools in UHSI. This implies that both students and teachers equally agree that teachers' factors limit the utilization of internet resources in teaching and learning of biology.

Conclusions

Based on the data which has been analysed and the subsequent discussion, it is concluded:

1. Utilization of internet resources maximized students' engagement and enhanced their knowledge about biology. However their uses were limited by students' lack of ICT skills and being a source of distraction. This answers question one.
2. Facilities factors including ICT laboratory, internet connectivity, computers and other devices were limiting factors to utilization of internet resources. This answers question two.
3. Lack of ICT skills among biology teachers, lack of adequately-trained biology teachers, high cost of data and limited support from the management as well as ignorance among biology teachers on the benefits of the integration of IT resources were some limiting factors to utilization of internal resources. This answers question three.
4. There is no significant difference between the mean response scores of students and teachers on students' factors that limit the utilization of internet resources in teaching and learning of biology in senior secondary schools in UHSI.
5. There is no significant difference between the mean response scores of students and teachers on teachers' factors that limit the utilization of internet resources in teaching and learning of biology in senior secondary schools in UHSI.

Recommendations

Based on the findings and conclusions of the study, the following recommendations were put forward:

1. Government and school management board should provide computers and other internet resources to secondary schools.
2. Schools should organize trainings on digital skills acquisition for both teachers and students. They should be encouraged to take digital courses outside of the school.
3. The school should find a way to balance student freedom with administrative oversight over what students can and cannot access over the internet to avoid misuse.
4. Constant supervision of teachers should be carried to ensure quality and standard of education are maintained.

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