INFLUENCE OF GENDER ON TEACHERS' UTILIZATION OF E-LEARNING RESOURCES IN TEACHING BIOLOGY IN NSUKKA LOCAL GOVERNMENT AREA

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Abstract

This study ascertained the influence of gender on the utilization of e-learning resources in teaching Biology in secondary schools in Nsukka Local Government Area, Enugu State. The study employed ex post facto research design. Three research questions, and one null hypothesis guided the study. The population comprised all the 54 Biology teachers from 30 public secondary schools. The study was underpinned by the Technology Acceptance Model. Data were collected using a structured questionnaire titled the Utilization of E-learning Resources Questionnaire (UE-LRQ) developed by the researchers. The instrument was validated by experts, and its reliability index was determined to be 0.80 using Cronbach Alpha. Data collected were analysed using descriptive statistics, specifically frequency and percentage to answer the research questions. The hypothesis was tested using t-test at a 0.05 level of significance. The findings revealed that male teachers utilize e-learning resources more than female teachers. The influence of gender on teachers' utilization of e-learning resources in senior secondary schools is significant. In addition, male and female teachers face several challenges in utilizing these resources, including limited access to technology, lack of confidence, and limited digital skills and knowledge among others. Strategies suggested to ameliorate these challenges include gender inclusive curriculum, effective supervision of teachers and adequate provision of e-learning resources.

Keywords: Biology, e-learning, gender, utilization, teacher education

Introduction

The educational development of any nation requires the utilization of e-learning for effective Biology instruction. E-Learning refers to the use of electronic technologies, particularly internet in transferring knowledge globally to facilitate interactive learning experiences (Chebichi, Dinah & Robert, 2024). E-learning stands out as the most efficient technological-driven teaching methods, heavily relying on modern technological resources for teachers to tap the rich information on Biology from the internet (Sulaiman, Muhammad & Ibrahim, 2025). Teaching of Biology becomes more interesting and enjoyable when gender equality of the teachers towards utilization of e-learning resources continues, enabling them to exchange ideas with students in the classroom.

E-learning resources take various forms to facilitate online teaching and learning. E-learning resources encompass hardware and software technologies that support academic objectives. Nwana and Usifoh, (2023) mentioned a wide variety of resources such as computer, printer, scanner, internets, e-pen, e-portfolio, email, e-reader, e-board, CD-ROM, projectors, and others. Other examples of popular e-learning resources include Zoom, YouTube, Coursera, WhatsApp, Google Meet, Smartphones, PowerPoint software, Electronic-materials (E-books, E-Journals, etc.), and Google Classroom. These diverse resources enable students and teachers to engage with educational content and are

designed to be reused for different learning styles, knowledge levels, and conditions. Alkhawaldeh, Khasawneh, and Alsarayreh (2023) highlighted its aim to create an interactive setting transforming traditional classrooms to smart classrooms.

The utilization of e-learning resources in teaching and learning of Biology in secondary schools is rapidly becoming more prevalent. E-learning, or electronic learning also referred to as online learning, or virtual learning has been accepted at all levels of education not only as supplementary instructional resource but a dominant alternative to traditional classroom (Okoli, Ogbuka & Anikwe, 2025). Teachers currently utilize e-learning resources like computers to demonstrate a new lesson, illustrate and show new website. For example, students can have clear explanation of some complex and abstract Biology processes and procedures such as genetics, digestion, and respiration when they are visualized and demonstrated. A virtual dissection app can allow students to explore anatomy without using physical specimens (Agboola, 2025). Urunova (2023) confirmed that using e-learning in teaching of human anatomy and physiology enable students to develop their knowledge and independent research. Again, interactive animation can be used when material is dangerous to the life of the students. When teaching the tigger, the teacher cannot bring wild animal in the class but can present a film or video or network the zoo to the classroom through the internet (Mathew, Onimisi, Salifu, Fakolade & Abuh, 2017). Similarly, the teacher can instruct the students to use the smartphones for an assignment in or outside the classroom and this makes learning of Biology easier and more engaging.

E-learning can be categorized into two main types. The first type is synchronous learning, where both students and teachers access the internet simultaneously to deliver materials and engage in discussions on various subjects, research, and lessons. The second type is asynchronous learning, which enables students to access lessons at their convenience through a predetermined educational program, allowing flexibility in choosing suitable times and locations based on individual circumstances (Qashou, 2022). In Nigeria, the two types of e- learning are crucial to overcome physical limitations and encourage personalized learning which is required to improve students learning outcomes in Biology.

Biology, as part of science is concerned with the co-existence of living and non-living things and their interactions in their environment. For Sulaiman, et al., (2025) Biology offers students opportunity to understand life processes, ecological interactions and relationship found in living things. Biology is more than just studying life; it directly impacts the world around us by helping us understand living things and managing living organisms. As the learning of Biology advances, biological knowledge become essential for various careers such as medical sciences, pharmaceutical sciences, and biotechnology (Onu, Ugwu, Ugwu, Ngwu, Aham, Aniaku, Ibe & Onyegegbu, 2022). Additionally, the Biology curriculum aims to develop broadly applicable skills such as problem-solving, communication, critical thinking, and objective reasoning for students to become productive and valuable members of society. Owolarafe, Abdulraheem and Bolaji (2024) remarked that these proficient laboratory and field skills can be realized by using e-learning resources since the biology curriculum has emphasized on teaching using innovative and student-centered methods such as e- learning. Thus, to improve Biology instruction, it is essential to consider the role of gender and how teachers utilize these e-learning resources.

Gender of Biology teachers in utilizing e-learning resources is considered as a problem that requires urgent attention by researchers. In Nigeria, despite the various

programs of the government to bridge the gender gap in utilizing e-learning resources, significant differences persist in Biology (Zainab, 2026; Achufusi & Ezeobi, 2024; Qashou, 2022). Research has shown that male teachers are susceptible to using these resources than female teachers (Nduwayezu, Ngendabanga, Murekaze, Byishimo, Yues, Nzabalirwa, Ndayambaje 2022; Tena, Almenara & Osua, 2016). On the other hand, some studies differ from this finding by having females demonstrating more positive online learning outcomes than males (Alkhawaldeh, et al., 2023; Miqdadi, Nawafleh & Baker, 2024). Manica, Mitja, Damijana and Vida (2020) reported that some ICT tools are more frequently utilized by female teachers than males while the male teachers are better than females in certain related attitudes. Still, some researchers find no significant difference between male and female teachers (Enung, 2022; Unegbu, Ogugoa, Nnadimele & Nse 2020). Despite the utilization of e-learning resources in teaching Biology based on gender, efforts towards its utilization have been limited due to many challenges. Nduwayezu, et al., (2022) and Singh (2019) mentioned some gender-specific challenges of teachers' utilization of e-learning resources in teaching Biology such as limited access to e-learning resources, lack of digital competence, low or lack of e-learning skills and knowledge, and less computer anxiety on the part of female teachers. Singh (2019) also indicated that female teachers may be discouraged in utilizing e-learning resources because of their psychological nature and political impediments. From these reports, it may be noted that there is influence of gender on the challenges faced by teachers in the utilization of e-learning resources.

The strategies that can effectively ameliorate the challenges that teachers face in utilizing e-learning resources in Biology based on gender are proposed by researchers. Zainab (2025) suggested gender-inclusive Biology curriculum as a strategy to ensure a gender-friendly e-learning environment. Wu (2025) mentioned some strategies such as proper distribution of e learning resources, updating resources, digital training for teachers, parent-school collaboration, technical policies and providing information security. This means that there should be increased funding for schools to invest in high-quality e-learning resources, use of up-to-date e-learning resources, regular training to enhance teachers' digital literacy and pedagogical skills, and easy access to technical support by teachers. Again, on the strategies of curbing gender stereotypes, Ebuk and Osaikuwuominan (2019) remarked that supervisory strategies of school principals should encourage the teachers to develop interest on utilizing e-learning resources in Biology. Together, these strategies create a more supportive and resourceful environment that empowers teachers to overcome the barriers of utilization of e-learning resources in the biology classrooms.

Theoretically, this study is anchored on the Technology Acceptance Model (TAM) by Davis (1989) in Markyan and Papagianidis (2026). TAM focuses on how users accept and use technology. This focuses on perceived ease of use (how easy the technology is to use) and perceived usefulness (how helpful the technology is for work). This theory relates to this study because if teachers utilize e-learning resources to promote active learning, they become more familiar with the resources and more willing to use them. This study uses TAM to explore how gender affect the teacher's utilization of e-learning resources in Biology. There have been less research reports on the influence of gender on the utilization of e-learning resources. It is important for researchers to bridge the gap found because of no agreement on the influence of gender on utilization of e-learning resources by teachers to ensure efficiency of teachers in Biology instruction. Furthermore, this study

investigated the challenges and strategies to overcome the challenges on the influence of gender on teachers' utilization of e-learning resources in teaching Biology.

Statement of the Problem

The utilization of e-learning resources in teaching Biology has helped teachers to be creative and innovative. Despite the recognized benefits of e-learning resources in enhancing teaching of Biology, the influence of gender has been reported by many researchers as a major hindering factor affecting teachers' utilization of e-learning resources in Biology. This is because male and female Biology teachers do not have uniform challenges such as access, to e-learning resources which may affect their utilization of e- learning resources. From the current research findings there are controversies on the influence of gender on teachers' utilization of e-learning resources. Following these controversies, this study seeks to investigate the influence of gender in utilizing e-learning resources in teaching Biology in Nsukka Local Government Area. This study also examines the constraints to effective utilization and provide strategies that can be adopted to ameliorate the challenges faced by Biology teachers in utilizing e-learning resources.

Purpose of the Study

The general purpose of this study is to determine the influence of gender on the utilization of e-learning resources in teaching senior secondary school Biology. Specifically, this study specifically determined the:

1. influence of gender on teachers' utilization of e-learning resources in teaching Biology.
2. challenges faced by male and female teachers in the utilization of e-learning resources in teaching Biology.
3. strategies to ameliorate the challenges faced by male and female teachers in the utilization of e-learning resources in teaching Biology.

Research Questions

The study was guided by the following research questions.

1. What is the influence of gender on teachers' utilization of e-learning resources among senior secondary school Biology students?
2. What are the challenges faced by male and female teachers in the utilization of e-learning resources in teaching Biology in senior secondary schools?
3. What strategies can be adopted to ameliorate the challenges faced by male and female teachers in the utilization of e-learning resources in teaching Biology?

Hypothesis

The null hypothesis formulated to guide the study was tested at 0.05 level of significance.

$H0_1$: The influence of gender on teachers' utilization of e-learning resources in teaching of Biology in senior secondary schools is not significant.

Methods

The study adopted ex post facto research design. This makes the information valid because the influence of gender investigated already existing teachers' utilization of e-learning resources. The population comprises all the 54 Biology teachers in 30 public secondary schools in Nsukka Local Government Area of Enugu State. The sample was all the 54 Biology teachers in Nsukka L. G. A. Three research questions, and one null hypothesis guided the study. The study was underpinned by the Technology Acceptance Model. Data were collected using a structured questionnaire titled the Utilization of E-

Learning Resources Questionnaire (UE-LRQ) developed by the researchers. The instrument was validated by experts, two from Biology unit and one from Measurement and Evaluation unit, all from Department of Science Education, Faculty of Education, University of Nigeria, Nsukka. The questionnaire was divided into two sections A and B. Part A covered the respondents' demography, while Part B was further divided into three clusters. Cluster one sought information on the influence of gender on teachers' e-learning utilization in teaching Biology. Cluster two sought information on the challenges faced by teachers in the utilization of e-learning resources in teaching Biology. Cluster three sought information on strategies to ameliorate the challenges faced by teachers in the utilization of e-learning resources in teaching Biology. The reliability index was determined to be 0.80 using Cronbach Alpha. Alpha and it yielded reliability indices of 0.77, 0.80 and 0.82 for clusters 1, 2, and 3 respectively.

Results

Research Question 1: What is the influence of gender on teachers' utilization of e-learning resources among senior secondary school Biology students?

Table 1: Mean and standard deviation of the influence of gender on teachers' utilization of e-learning resources among senior secondary school Biology students.

S/N	Item Statement	Gender	Mean	SD	Decision
1.	Zoom	Male	3.00	0.00	Utilized
		Female	3.45	0.50	Utilized
2.	Email	Male	3.00	0.55	Utilized
		Female	3.30	0.56	Utilized
3.	YouTube	Male	3.00	0.00	Utilized
		Female	3.55	0.50	Utilized
4.	WhatsApp	Male	3.71	0.47	Utilized
		Female	3.75	0.44	Utilized
5	Google meet	Male	2.14	1.03	Not Utilized
		Female	1.50	0.82	Not Utilized
6	Power Point software	Male	3.57	0.51	Utilized
		Female	2.20	1.04	Not Utilized
7	Skype	Male	1.29	0.47	Not Utilized
		Female	1.48	0.51	Not Utilized
8	Messenger	Male	3.00	0.96	Utilized
		Female	2.83	0.90	Utilized
9	Projectors	Male	3.29	1.07	Utilized
		Female	2.15	1.33	Not Utilized
10	Khan academy	Male	1.57	0.51	Not Utilized
		Female	1.60	0.59	Not Utilized
11	Electronic materials (E-books, E-journals)	Male	1.29	0.47	Not Utilized
		Female	1.43	0.64	Not Utilized
12	Google classroom	Male	2.14	1.17	Not Utilized
		Female	1.35	0.58	Not Utilized

N = 54 (M = 14, F = 40); X < 2.50 = Disagree; $X \geq 2.50$ = Agree

Table 1 presents results from the analysis of data collected to ascertain the influence of gender on teachers' utilization of e-learning resources among senior secondary school

biology students. The findings shows that items 1, 2, 3, 4, and 8 had mean responses greater than 2.50 for male and female teachers. This is an indication that the e-learning resources represented by those items (Zoom, email, YouTube, WhatsApp, and Messenger) are utilized by male and female Biology teachers. However, items 5, 7, 10, 11 and 12 had mean responses less than 2.50. This shows that the items represented by the items (Google meet, Skype, Khan Academy, Electronic materials, and Google classroom) are not utilized by male and female teachers. On items 6 and 9, male teachers had a mean response of 3.57 and 3.29 respectively while female teachers had a mean response of 2.20 and 2.15 respectively. This shows that while male teachers utilize PowerPoint (item 6) and projectors (item 9), female teachers do not.

Hypothesis 1

The influence of gender on teachers' utilization of e-learning resources in teaching Biology is not significant.

Table 2: T-test analysis of the influence of gender on teachers' utilization of e-learning resources in teaching Biology

Gender	N	Mean	SD	Df	t.	Sig. (2-tailed)
Male	14	31.00	2.41	52	3.834	0.000
Female	40	28.58	1.83			

Table 2 presents result from analysis of data collected to determine the influence of gender on teachers' utilization of e-learning resources in teaching Biology. The result shows that the probability value is 0.000. Since the probability value of 0.000 is less than 0.05, the null hypothesis is rejected. Thus, the influence of gender on teachers' utilization of e-learning resources is significant.

Research Question 2: What are the challenges faced by male and female teachers in the utilization of e-learning resources in teaching Biology in senior secondary schools?

Table 3: Mean and standard deviation of challenges faced by male and female teachers in the utilization of e-learning resources in teaching Biology in senior secondary schools

S/N	Item Statement	Gender	Mean	SD	Decision
1.	I face challenges adopting electronic materials (e-book, e-journal) in teaching Biology.	Male	3.00	0.00	Agree
		Female	3.45	0.50	Agree
2.	Inadequate training limits my ability to use projector screen effectively in teaching Biology	Male	3.00	0.55	Agree
		Female	3.30	0.56	Agree
3.	The lack of reliable infrastructure affects my use of E-learning resources	Male	3.00	0.00	Agree
		Female	3.55	0.50	Agree
4.	Preparing PowerPoint software for Biology lessons is time-consuming	Male	3.71	0.47	Agree
		Female	3.75	0.44	Agree
5	Gender does not affect how teachers face challenges with E-learning	Male	2.14	1.03	Disagree
		Female	1.50	0.82	Disagree
	Cluster Mean	**Male**	**2.58**	**0.60**	**Agree**
		Female	**2.38**	**0.70**	**Disagree**

$N = 54$ ($M = 14$, $F = 40$); $X < 2.50$ = Disagree; $X \geq 2.50$ = Agree

Table 3 presents results from the analysis of data collected to determine the challenges faced by teachers in the utilization of e-learning resources in teaching Biology in senior secondary schools. The findings show that the respondents agreed to all items on the cluster (1 – 5), with mean responses greater than the 2.50 benchmark mean for

"agreed". This is an indication that all the items on the cluster represent challenges faced by teachers in the utilization of e-learning resources in teaching Biology in senior secondary schools. Therefore, the challenges faced by teachers in the utilization of e-learning resources in teaching Biology in senior secondary schools include challenges in adoption of e-books, inadequate training, lack of reliable infrastructure, time it takes to prepare PowerPoint, among others. The cluster standard deviation of 0.60 and 0.70 for male and females respectively indicates that the mean responses of females varied more from the cluster mean than that of their male counterparts.

Research Question 3: What strategies can be adopted to ameliorate the challenges faced by teachers in the utilization of e-learning resources in teaching Biology?

Table 4: Mean and standard deviation of strategies can be adopted to ameliorate the challenges faced by teachers in the utilization of e-learning resources in teaching Biology.

S/N	Item Statement	Gender	Mean	SD	Decision
1.	Teachers need regular training on how to use e-learning tools.	Male	3.57	0.51	Agree
		Female	3.30	0.56	Agree
2.	Schools should provide funds to purchase better e-learning resources for teachers.	Male	3.57	0.51	Agree
		Female	3.40	0.50	Agree
3.	Teachers should have easy access to technical support when they have issues with e-learning.	Male	3.57	0.51	Agree
		Female	3.25	0.44	Agree
4.	New teachers should be taught how to use e-learning before they start teaching.	Male	3.14	0.66	Agree
		Female	3.30	0.56	Agree
5.	Schools should provide stable internet so teachers can use e-learning without problems.	Male	3.71	0.47	Agree
		Female	3.35	0.58	Agree
6.	Teachers who use e-learning well should be rewarded to encourage others.	Male	3.29	0.73	Agree
		Female	3.55	0.50	Agree
7.	The government should create policies that help teachers use e-learning better.	Male	3.29	0.47	Agree
		Female	3.35	0.48	Agree
8.	Teachers should work together and share ideas to improve how they use e-learning.	Male	3.43	0.51	Agree
		Female	3.35	0.48	Agree
9.	Schools should provide enough digital tools (like laptops and projectors) to support e-learning.	Male	3.43	0.51	Agree
		Female	3.30	0.56	Agree
10.	Teachers should have less workload, so they have enough time to use e-learning effectively.	Male	3.00	0.55	Agree
		Female	3.05	0.75	Agree
Cluster Mean		**Male**	**3.40**	**0.54**	**Agree**
		Female	**3.32**	**0.55**	**Agree**

***N** = 54 (M = 14, F = 40);* ***X** < 2.50 = Disagree;* ***X** ≥ 2.50 = Agree*

Table 4 presents results from the analysis of data collected to determine the strategies that can be adopted to ameliorate the challenges faced by teachers in the utilization of e-learning resources in teaching Biology. The findings show that the respondents agreed to all items on the cluster (1 – 10), with mean responses greater than the 2.50 benchmark mean for "agreed". This is an indication that all the items on the cluster represent the strategies that can be adopted to ameliorate the challenges faced by teachers in the utilization of e-learning resources in teaching Biology. Therefore, the strategies that can be adopted to ameliorate the challenges faced by teachers' in the utilization of e-learning resources in teaching Biology include: Teachers need regular training on how to use e-learning tools, schools should provide more money to get better

e-learning resources for teachers, and teachers should have easy access to technical support when they have issues with e-learning, among others. The cluster standard deviation of 0.54 and 0.55 for male and females respectively indicates that the mean responses of females varied more from the cluster mean than that of their male counterparts.

Discussion of the Findings

The findings of this study contradict that of Achufusi and Ezeobi (2024) which revealed that there is no significant difference in the mean ratings of male and female biology teachers in the utilization of instructional resources. The result of this study agrees with the findings of Miqdadi, Nawafleh and Baker (2024) which posited that female teachers has mean rating slightly higher than that of males though the difference was not significant because both groups utilize the e-learning resources to a moderate extent. The result of this study is in conformity with the findings of Unegbu et al., (2020) who revealed that both male and female teachers utilize e-learning and suggested that teachers should attend seminar for professional development. The findings of this study tally with that of Ebuk and Osaikuwuominan (2019) which showed that there is statistical difference in the challenges due to gender. The results also showed that there is no significant difference between the extent of utilization of e-learning resources by male and female teachers. The findings agreed with that of Tena et al., (2016) which revealed that male teachers utilize e-learning resources more than female students.

Some researchers in their findings revealed challenges such as lack of access, low or non-utilization of e-learning resources and others. In view of this, the findings of this study are consistent with the findings of Nduwayezu, et al., (2022) and Singh (2019) who mentioned some challenges of the female teachers in utilizing the e-learning resources as lack of competence, pedagogical knowledge, access, and willingness. The findings agreed with that of Zainab (2025) which suggested effective inclusive teaching strategy for gender-inclusive curriculum in Biology and Ebuk and Osaikuwuominan (2019) remarked supervisory strategies of school principals to encourage female teachers to develop interest on utilizing e-learning resources in Biology.

Conclusion

The study highlighted the teachers' utilization of e-learning resources in senior secondary schools, revealing a gender-based disparity in utilization. The report that male teachers utilize e-learning resources more than female teachers suggest a gap in digital utilization. Furthermore, the study underscores the pressing need to mitigate challenges that hinder male and female teachers' utilization of e-learning resources in Biology instruction and one of the identified challenges is access to technology. Again, one of the most effective strategies pointed out is that principals should engage in supervision to encourage the female teachers to utilize e-learning resources. Addressing these disparities will require a comprehensive approach that ensures all teachers, regardless of gender, have equitable access to and familiarity with diverse e-learning resources.

Recommendations

The following recommendations are made:

1. Teachers should seek professional development opportunities to enhance their digital literacy and effectively utilize diverse e-learning resources, into their teaching practices.

2. School Principals should encourage the female teachers to utilize e-learning resources.
3. Government should provide funds to schools for the procurement of e-learning resources.
4. Teacher training institutions should design and implement gender-inclusive digital literacy programs to ensure equal access to e-learning opportunities.

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