Analyzing Gender Disparities in E-Learning Usage and its Implications for Teaching Basic Science in Nigeria

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Abstract

The main purpose of the study is to find out if gender is a factor on the extent of utilization of e-learning resources in teaching Basic science in Enugu state. Two research questions and one hypothesis were formulated to guide the study. The population of the study comprised all the 32 (14 male and 18 female) basic science teachers in all the 31 public secondary schools in Nsukka LGA of Enugu State. A questionnaire titled Teacher's Utilization of E-learning Resources (TUER) was used to collect data from the respondents. The research questions were answered using checklist and descriptive statistics. The findings showed that many of the e-learning resources were not available and not utilized. The results also showed that there is no significant difference between male and female students on the extent of utilization of e-learning resources by male and female Basic Science teachers. Based on the findings, it was recommended among others, that both male and female basic science teachers should be encouraged to integrate e-learning facilities in their classroom activities through sustained in-service training, workshops, seminars and conferences.

Keywords: Basic Science; E-learning; Gender; Teachers

Introduction

Basic science is introduced as a foundational subject in the early stages of education. It is commonly taught in primary and junior secondary schools. Basic science aims to develop students' understanding of scientific concepts, principles, and methods through observation, exploration, and experimentation. Basic sciences provide the prerequisite scientific knowledge, attitudes and skills upon which subsequent scientific and technological advancement is based (FME, 2013). The curriculum usually covers a wide range of topics, including but not limited to:

- ➢ Introduction to Science: Understanding the nature and process of science, scientific inquiry, and the scientific method.
- ➢ Living Organisms: Studying plants, animals, and human beings, their characteristics, life cycles, and interactions with the environment.
- ➢ Matter and Energy: Exploring the properties of matter, changes in state, and basic concepts of energy and its forms.
- ➢ Forces and Motion: Understanding the principles of forces, motion, and simple machines.
- ➢ Earth and the Environment: Investigating the Earth's structure, weather, climate, and the importance of conserving natural resources.
- ➢ Simple Chemistry: Introducing basic chemical concepts, elements, compounds, and reactions.
- ➢ Basic Physics: Covering topics such as light, sound, electricity, and magnetism.
- ➢ Basic Astronomy: Exploring the solar system, stars, and other celestial objects.

The emphasis in basic science is typically on practical and hands-on learning experiences to develop students' critical thinking, problem-solving, and inquiry skills. Teachers use experiments, demonstrations, and field trips to reinforce theoretical concepts and make learning engaging.

A strong focus on basic science education holds immense potential for addressing key challenges like illiteracy and poverty, which hinder national progress (Nwachukwu, 2008). According to Akpan (2008), science plays a crucial role in enhancing various aspects of life, including health, nutrition, agriculture, transportation, material and energy production, and industrial development. It also ensures that our environment sustains life by providing clean air and safe drinking water, free from disease and decay. Recognizing science and technology as the foundation of sustainable development, the need to prioritize science education in Nigerian schools is emphasized. By empowering students with a solid understanding of science, they can contribute to the advancement and prosperity of the nation in a more sustainable and inclusive manner. The accessibility and effectiveness of basic science education can be significantly enhanced, empowering more individuals to actively contribute to Nigeria's development and progress, through the integration of e-learning.

E-learning encompasses a wide array of information and communication technologies (ICTs), internet-based tools, and electronic media that enhance teaching and learning, enabling the transfer of knowledge and skills (Kassa & Balunywa, 2013). Accessible through various electronic devices like computers, laptops, tablets, and smartphones, e-learning offers a versatile and convenient way for students to learn from any location. E-learning is not limited to distance-based online courses; it can also be integrated into traditional classroom instruction, utilizing digital interactive tools and fostering collaboration through online networking communities (Waller, 2001). With the growing reliance on internet searches for information, the significance of e-learning in education has increased significantly. Interactive classes, live lectures, video conferencing, and discussion forums enable participants to engage in fruitful

debates and share their perspectives on various topics (Eke, 2011).

Teachers have responded to the trend by designing online courses to improve learning and teaching effectiveness (Evans, 2014). Studies have indicated that online learning enhances student participation, improves discussion quality, and fosters meaningful interactions among learners. The incorporation of mobile technologies, such as applications and computers, further facilitates easy access to online learning platforms and enhances the effectiveness of mobile learning (Panigrahi et al., 2018). As technology continues to advance, offering dynamic and innovative ways to acquire knowledge and develop essential skills in an increasingly digital world, e-learning resources have become an integral part of modern education.

E-learning resources encompass a wide array of educational materials available on the Internet within an online learning environment. These resources can take various forms, such as HTML documents containing course or chapter objectives, lecture notes, assignments, and answers to chapter questions. Additionally, they may include audio or video lessons, interactive exercises or exams, and documents providing links to other websites. Some examples of popular e-learning resources include Zoom, E-mail, YouTube, Lynda, Coursera, WhatsApp, Messenger, Udemy, Projector screen, Google Meet, Khan Academy, Smartphones, Computers, PowerPoint software, Projectors, Electronic materials (E-books, E-Journals, etc.), Skype, Digital libraries, and Google Classroom. These diverse resources contribute to a dynamic and accessible online learning experience, enabling students and educators to engage with educational content in various interactive and innovative ways. As e-learning continues to shape modern education, it is essential to consider the role of gender in how teachers engage with technology and online learning platforms.

Gender can play a role in how teachers use e-learning resources in Nigeria, as it can influence their familiarity with technology, confidence in using digital tools, and attitudes towards integrating technology into their teaching practices. Research has shown that female teachers, in some contexts, may have lower access to and familiarity with technology compared to their male counterparts (Ahmed & Farid, 2015; Oguntuase & Akinbode, 2014). This disparity might affect their willingness and ability to effectively incorporate e-learning resources in their classrooms. Moreover, societal norms and expectations can also impact teachers' attitudes towards technology adoption. In some cases, gender stereotypes and traditional gender roles may influence teachers' beliefs about technology use, leading to variations in their approach to e-learning (Crompton & Keane, 2017).

Numerous studies have examined how gender differences in Internet usage and preferences impact the way men and women perceive and utilize technology (Mbonu & Okoli, 2019; Mbonu-Adigwe et al, 2022; Mbonu, Eya, Umate, & Attah, 2021; Mbonu-Adigwe & Ude, 2023). It has been observed that each gender tends to engage with the Internet in distinct ways. For instance, males typically employ the Internet and the Web to seek information, while females predominantly use it for communication purposes (Olorunda & Oyelude, 2013); Mchombu, 2016). Furthermore, research indicates that male teachers often exhibit higher comfort levels with e-learning compared to their female counterparts. On the other hand, females tend to demonstrate stronger self-regulation, resulting in more positive online learning outcomes for them (Alghamdi et al., 2020). Studies have also suggested that females are more

communicative, exhibit greater social presence, and express higher satisfaction with online courses than males. However, the influence of gender on the adoption of e-learning platforms by teachers to facilitate efficient and effective learning solutions remains a critical question.

Therefore, the primary objective of this study is to assess whether the implementation of e-learning in teaching basic science is contingent upon the gender of the instructor. By delving into this aspect, we aim to gain insights into how gender dynamics may impact the successful integration of e-learning strategies in the teaching and learning process, providing valuable insights for educators and policymakers to foster more inclusive and effective e-learning practices.

Research questions

The following research questions were posed to guide the study;

1. What is the extent of availability of e-learning resources for Basic science teaching in Enugu state?
2. What is the extent of utilization of e-learning resources by male and female basic science teachers in Enugu state?
3. What are the constraints to effective utilization of e-learning resources in Enugu state?
4. What are the possible ways to improve the utilization of e-learning resources in basic science teaching irrespective of gender?

Research Hypothesis

Ho_1; There is no significant difference on the extent of utilization of e-learning resources by male and female basic science teachers.

Method

The study used a survey research design. The design was considered appropriate because descriptive survey studies are interested in describing the characteristics of certain group of people considered a representative sample of the entire group. The study was carried out in Nsukka Local Government Area in Enugu State. The population of the study comprises all the 32 Basic Science Teachers in all the 31 community secondary Schools in Nsukka Local Government Area of Enugu State in the 2021/2022 academic session which is made up 14 male and 18 female basic science teachers (source: Post Primary School Board, Nsukka Zonal Office, 2022). The sample of the study consisted of 32 JSS 1-3 Basic Science Teachers constituting 100% of the total population of Basic Science Teachers in Nsukka Local Government Area of Enugu state.

A questionnaire titled "Teacher's utilization of e-learning resources" (TUER) was used to collect data from the respondents. It was divided into two parts. Part A elicited information on respondents' gender while part B was divided into four clusters and took care of the research questions. Cluster 1 was a checklist that showed the availability of the e-learning resources. Data obtained from trial-testing was used to determine the internal consistency of the instruments using Cronbach-alpha technique which yielded a coefficient of 0.82 and was considered acceptable. The questionnaire was administered to the respondents by the researcher with the help of two (2) research assistants. The filled questionnaires were collected

on the spot ensuring a 100% return.

The research questions were analyzed using descriptive statistics. Specifically, frequency and percentage were used to answer research question one. If the percentage is less than 50%, the e-learning resources is regarded as not available but if the percentage is 50% and above, the e-learning resources is regarded as available.

Research questions 2,3 and 4 was answered using mean and standard deviation. Any mean score <2•50 is regarded as Low Extent (and disagree) while mean ≥2•50 is regarded as High Extent (and agree). The null Hypothesis was texted using t-test at 0.05 level of significance.

RESULTS

Research Question 1: To what extent are e-learning resources available for teaching Basic science teaching in Enugu state?

Table 1: Availability of e-learning resources for teaching Basic science teaching in Enugu state.

S/N	E-Learning Resources	Frequency	Percentage (%)	Remark
1.	Zoom	22	68.57	Avail.
2.	E-mail	29	90.63	Avail.
3.	YouTube	28	87.50	Avail.
4.	Lynda	01	0.03	Not Avail.
5.	Coursera	11	34.38	Not Avail.
6.	WhatsApp	32	100	Avail.
7.	Messenger	31	96.88	Avail.
8.	Udemy	07	21.88	Not Avail.
9.	Projector screen	06	18.75	Not Avail.
10.	Google meet	02	6.25	Not Avail.
11.	Khan academy	04	12.50	Not Avail.
12.	Smart phone	32	100	Avail.
13.	Computers	28	87.50	Avail.
14.	Power point software	23	71.88	Avail.
15.	Projectors	07	21.88	Avail.
16.	Electronic materials [E-book, E-journal, etc]	09	28.13	Not Avail.
17.	Skype	06	18.75	Not Avail.
18.	Digital library	04	12.50	Not Avail.
19.	Google classroom	05	15.63	Not Avail.

Table I presents results of data collected to ascertain the extent to which e-learning resources are utilized for teaching Basic science teaching in Enugu state. Findings show that all e-learning resources available in schools for teaching Basic Science in Enugu State are WhatsApp, Messenger, ZOOM, computers, smartphones, PowerPoint, Email, YouTube and projectors. However, findings show that resources not available for teaching Basic Science in Enugu State are: Lynda, Coursera, Udemy, Google meet, Khan academy, Electronic materials, Skype, Digital library, Google classroom, Khan Academy,

Research Question 2: To what extent are e-learning resources utilized by male and female Basic science teachers in Enugu state?

Table 2: Extent to which e-learning resources are utilized by male and female basic science teachers in Enugu state.

S/N	Item Statement	Male (N = 14)		Female (N = 18)	
		Mean (Dec.)	SD	Mean (Dec.)	SD
1.	Zoom	3.14 (HE)	1.29	2.33 (LE)	0.84
2.	E-mail	3.14 (HE)	1.03	3.17 (HE)	0.79
3.	YouTube	2.93 (HE)	1.00	2.72 (HE)	0.75
4.	Lynda	1.79 (LE)	1.05	1.33 (LE)	0.59
5.	Coursera	1.43 (LE)	0.76	1.56 (LE)	0.70
6.	WhatsApp	3.64 (HE)	0.63	3.78 (HE)	0.43
7.	Messenger	2.79 (HE)	0.70	3.00 (HE)	0.77
8.	Udemy	1.86 (LE)	0.77	1.61 (LE)	0.78
9.	Projector screen	2.43 (LE)	1.02	2.11 (LE)	0.68
10.	Google meet	1.64 (LE)	0.84	2.28 (LE)	0.83
11.	Khan academy	1.71 (LE)	0.61	1.56 (LE)	0.70
12.	Smart phone	2.57 (HE)	0.85	3.50 (HE)	0.51
13.	Computers	2.29 (LE)	0.61	3.11 (HE)	0.76
14.	Power point software	1.93 (LE)	1.07	2.17 (LE)	0.79
15.	Projectors	2.64 (HE)	0.84	2.72 (HE)	0.96
16.	Electronic materials [E-book, E-journal]	2.79 (HE)	1.31	1.89 (LE)	0.90
17.	Skype	1.71 (LE)	0.91	2.06 (LE)	0.87
18	Digital library	2.50 (HE)	1.09	2.06 (LE)	0.94
19.	Google classroom	2.07 (LE)	0.92	1.94 (LE)	1.06
	Cluster Mean	**2.37 (LE)**	**0.91**	**2.36 (LE)**	**0.77**

Dec. = Decision;   Mean < 2.50 = LE (Low Extent); Mean ≥ HE (High Extent);   SD = Standard Deviation

Table 2 presents results of data collected to ascertain the extent to which e-learning resources are utilized by male and female basic science teachers in Enugu state. Findings show that all e-learning resources are utilized to different extents by Basic Science teachers. The findings show that e-learning resources like e-mail, YouTube, WhatsApp, Messenger, Smartphone, Projector, are utilized by male and female Basic Science Teachers to a high extent (mean score > 2.50). also, e-learning resources like Lynda, Coursera, Udemy, Udemy, Projector, Google meet, Khan Academy, PowerPoint software, Skype, Google classroom, with mean scores below 2.50, are all utilized by male and female basic science teachers to low extent. E-learning resources like ZOOM, electronic materials, and digital library are utilized by male teachers to a high extent but to a low extent by female teachers, but computers are utilized to a low extent by male teachers and to a high extent by female teachers. The cluster standard deviation rating (0.91 for male teachers and 0.77 for female teachers) is an indication that the responses provided by female teachers were more similar to each other than those provided by male teachers.

Research Question 3: What are the constraints to effective utilization of e-learning resources in Enugu state?

Table 3: Constraints to effective utilization of e-learning resources in teaching Basic science in Enugu state

S/N	Item Statement	N	Mean	SD	Decision
1.	Lack of e-learning resources in the school.	32	3.06	0.67	Agree
2.	Lack of technical know-how to use e-learning resources.	32	3.16	0.81	Agree
3.	Epileptic power supply.	32	3.31	0.78	Agree
4..	Shortage of internet data to use e-learning resources.	32	2.75	0.80	Agree
5.	Ignorance of the existence of e-learning resources.	32	3.13	0.79	Agree
6.	Teacher's ability to access smart devices for e-learning.	32	2.50	0.80	Agree
7.	Parental support for students to take part in e-learning classes.	32	2.69	1.00	Agree
8.	General perception of e-learning resources.	32	2.69	0.82	Agree
	Cluster Mean	**32**	**2.91**	**0.81**	**Agree**

Table 3 shows results of analysis from data collected to determine the constraints to effective utilization of e-learning resources in teaching Basic science. The finding shows that all items on cluster 3 represent constraints to effective utilization of e-learning resources in teaching Basic science, with mean scores ranging from 2.50 – 3.31. The cluster standard deviation of 0.81 is indication that the responses provided by the respondents are similar to each other.

Research Question 4: What possible strategies can be adopted to improve the utilization of e-learning resources for basic science teaching?

Table 4: Possible strategies to improve the utilization of e-learning resources in teaching basic science.

S/N	Item Statement	N	Mean	SD	Decision
1.	Government should provide enough e-learning resources in schools and institutions.	32	3.09	0.89	Agree
2.	Institutions should be organizing workshops and conferences to equip teachers with enough technical know-how to utilize available e-learning resources.	32	3.00	0.92	Agree
3.	Institutions should provide adequate power supply.	32	3.53	0.67	Agree
4..	WiFi should be made available to teachers in other to enhance usability of e-learning resources.	32	3.03	0.90	Agree
5.	Creating awareness on the existing e-learning resources.	32	3.13	0.71	Agree
6.	Smart devices such as smart phones, laptops etc should be made available to teachers.	32	2.88	1.01	Agree
7.	Parents should support their children/students to take part in e-learning classes.	32	2.91	0.93	Agree
8.	Creating awareness to the general public about e-learning resources.	32	2.84	0.85	Agree
	Cluster Mean	**32**	**3.05**	**0.86**	**Agree**

Table 4 shows results of analysis from data collected to identify possible strategies to improve the utilization of e-learning resources in teaching basic science. The finding shows that all items on cluster 4 represent possible strategies to improve the utilization of e-learning resources in teaching basic science, with mean scores ranging from 2.84 – 3.53. The cluster standard

deviation of 0.86 is indication that there was little variation in the responses provided by the respondents.

Hypothesis 1: There is no significant difference in the extent of utilization of e-learning resources by male and female basic science teachers.

Table 5: T-test analysis of the difference in the extent of utilization of e-learning resources by male and female basic science teachers.

Gender	N	Mean	SD	Df	t.	Sig. (2-tailed)
Male	14	45.00	7.08	30	.047	.963
Female	18	44.89	6.22			

Result on Table 5 shows that the probability value of .963 is greater than 0.05, therefore, the null hypothesis is not rejected. Thus, there is no significant difference between male and female students on the extent of utilization of e-learning resources by male and female basic science teachers.

Discussion of Findings

Findings of this study have shown that the 9 items in table 1 were accepted by the respondents as the e-learning resources available for teaching Basic Science. Evidence from this research also indicated that all 19 items (e-learning resources) presented in Table 2 were recognized and utilized to varying degrees by Basic Science teachers. Notably, e-learning resources like ZOOM, electronic materials, and digital libraries were reported to be extensively utilized by male teachers, while their utilization by female teachers was comparatively lower. Conversely, computers were found to be more commonly utilized by female teachers and to a lesser extent by male teachers. Possible reasons contributing to this situation could be negative perceptions or stereotypes associated with e-learning resource use by females, limited exposure to technology, relative difficulty in navigating e-learning resources, and inherent gender differences. Further analysis showed that there is no significance influence of gender on the extent of utilization of E-learning resources. This result agrees with that of Mbonu & Okoli (2019); Mbonu-Adigwe et al, 2022; Mbonu, Eya, Umate, & Attah, 2021; and Mbonu-Adigwe & Ude, 2023, who from their respective studies found no significant influence of gender on technology usage.

These findings highlight the need for addressing gender-related factors when promoting the adoption and effective use of e-learning resources among educators. This finding disagrees with those of Olorunda and Oyelude (2013); Mchombu (2016) who reported from their respective studies that male teachers, compared with their female counterparts, had more access to computers, felt more confident with their computer skills, and showed more positive attitude toward computers and other e-learning resources. They also found that males had greater exposure to computers both in formal instructional settings and informal settings.

Additionally, the study reveals that all eight items presented in Table 3 were acknowledged by the respondents as constraints to the effective utilization of e-learning resources in teaching Basic Science. Some of these factors are within the control of individual respondents, while others are institutional challenges. This finding aligns with the assertion of Oguntuase and Akinbode (2014), who highlighted that the cost of procuring e-learning resources represents a significant obstacle to the successful implementation of digital academic

institutions in Nigeria. Addressing these constraints is essential for creating a conducive environment that fosters the seamless integration and utilization of e-learning resources in the teaching of Basic Science.

Furthermore, the study outlines potential strategies to enhance the utilization of e-learning resources in teaching Basic Science, as presented in Table 4. These strategies include advocating for government support in providing sufficient e-learning resources to schools and educational institutions. Additionally, the study suggests that organizing workshops and conferences can equip teachers with the necessary technical expertise to effectively utilize the available e-learning resources. Considering the global shift towards an information and knowledge-based society, mainstreaming e-learning resources in various aspects of life, particularly in the education sector, becomes imperative. This aligns with the views of Wilson (2015), who emphasized the importance of adequately providing e-learning facilities to facilitate their proper utilization in Nigerian schools.

By implementing these strategies, educators and institutions can enhance the integration of e-learning resources, fostering a technologically-driven and enriched learning environment that prepares students for success in the digital era.

Conclusions

The purpose of this study was to investigate gender disparities in the extent of utilizing e-learning resources in teaching Basic Science in Enugu state. The research findings revealed that male teachers may possess greater expertise and confidence in using e-learning resources compared to their female counterparts. Conversely, female teachers tended to adopt a more student-centred approach to teaching. Moreover, the study identified several constraints to the effective utilization of e-learning resources in teaching Basic Science in Enugu state. These constraints included a lack of technical know-how among teachers, insufficient availability of e-learning resources in schools, limited awareness of the existence of e-learning resources, and teachers' inability to access smart devices for e-learning purposes. Interestingly, the study did not find a significant difference in the extent of e-learning resource utilization between male and female Basic Science teachers. This suggests that gender may not be a decisive factor when it comes to the adoption and implementation of e-learning resources in the context of teaching Basic Science in Enugu state.

By acknowledging these findings, educators and policymakers can develop targeted interventions and support mechanisms to address the identified constraints and promote a more equitable and effective integration of e-learning resources in Basic Science education in Enugu state.

Recommendations

Based on the findings of this research study, the following recommendations were made;

1. Both male and female science educators should be encouraged to integrate e-learning facilities into teaching Basic science and also their everyday classroom activities through sustained in-service training, workshops, seminars and conferences.

2. E-learning facilities must also be adequately provided for proper utilization in the schools.

3. Female teachers in schools should be encouraged to embrace the use of e-learning resources like their male counterparts.

4. Seminars and workshops on e-learning resources should be organized for both male and female teachers. This will help to expose them more to the potentials which e-learning resources offers in the field of academics and through this way arouse their interest more towards the use of e-learning resources.

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