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INFLUENCE OF AVAILABILITY ON PRE-SERVICE TEACHERS' UTILIZATION OF E-LEARNING RESOURCES FOR INNOVATIVE SCIENCE EDUCATION IN NIGERIAN UNIVERSITIES

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ABSTRACT
Information and communication technology is rapidly taking over conventional forms of learning in schools globally. As a result, schools and colleges strive to install e-learning facilities aimed at digitizing the teaching and learning processes. This study, therefore, assessed the influence of availability on pre-service teachers' utilization of e-learning resources for improving innovative science education in Nigerian universities. The study adopted a descriptive survey approach in data collection. One research question, with a corresponding null hypothesis, guided the study. The sample consisted of 205 final-year science education undergraduates, comprising 84 males (41%) and 121 females (59%) drawn from two universities in south-eastern Nigeria. A researcher-made structured questionnaire was used for data collection. Mean with standard deviation, and a paired sample t-test were used in data analyses. The study found a significant influence of availability on pre-service teachers' utilization of e-learning resources, t(205) = 9.60, p = 0.00. The researchers recommend, among others, that the university management and other education stakeholders should prioritise the provision of e-learning resources in universities for enhancing innovative science education.

Keywords: availability, awareness, e-learning resource utilization, innovative science education, preservice teachers, university education.

Introduction
E-learning is electronically–assisted learning or learning with and through the use of electronic technologies. Akanbi (2020) views e-learning as the process of teaching and learning with the use of a computer via the internet. E-learning, according to Zolochevskaya et. al. (2021), essentially encompasses ICT on websites, personal computers, portable PCs, mobile phones, learning management systems (LMS), radio, and other forms of enhancing teaching and reading that require the application and usage of information and communications technology (ICTs). E-learning is a technology-mediated and

digitally empowered learning that utilizes hardware (PCs, tablets, printers, digital cameras, digital videos, scanners, overhead projector; OHP, and OHP screen), software (operating systems, cloud technologies, applications, writing, editing, MS Office, CD textbooks that fall in the category of courseware, OERS, and e-content) and others (USB drives, CD-ROM), whether from a distance or face-to-face classroom setting, to empower the teacher-student interactions (Dhurkari, 2017; Eze, Chinedu-Eze, & Bello, 2018). Ja'ashan (2020) opined that e-learning provides a new paradigm and a modern philosophy in teaching and learning that serves as a development platform for learners in present-day society based on knowledge. Accordingly, O'Brien (2020) opined that e-learning may be effectively used in teaching science subjects, especially through the use of smartphones, online systems, and social media platforms. Similarly, Oluwalola and Awodeji (2019) assert that e-learning facilities provide productive teaching and learning experiences that are aimed at increasing the capability of the users in tertiary institutions.

Meanwhile, Bates in Mishra (2007) and Wang (2009) reiterated that e-learning is one of the most significant educational innovations driven by an expanding array of technology-enabled platforms that offer potential learners an alternative and ICT-based innovative learning environment in education. Further, according to Nwana (2009) and Robinson (2009), e-learning can take the form of courses as well as modules that can be delivered through the internet, intranet, and extranet. E-learning is associated with such terms as online learning, virtual learning, digital learning, and computer-assisted learning. Contributing, Alemneh and Hastings (2006) noted that e-learning has enormous benefits, including cost-effectiveness, access to knowledge, social interaction, pedagogical richness, personal agency, and ease of revision. Alemneh and Hastings, however, observed that the implementation of e-learning faces some challenges, such as a shortage of computers, outdated curricula, language adaptability issues, insufficiently trained teachers with low ICT skills, lack of/epileptic power supply, expensive/slow internet connectivity, and lack/insufficient funding. Despite these challenges, Paola, Feroz, Moon, and Jeung (2011), Dhurkari (2017), and Udu et al. (2021) argue that e-learning is a significant and compelling strategy that should be introduced into institutions' current learning style and teaching methods for learner-oriented learning. They affirmed that learning and mentoring of learners may be approached using the PC as a learning process that involves digitally conveyed content, system-based services, and coaching support. In addition, Garrison (2011) asserts that e-learning utilization in the teaching-learning process helps learners to imbibe innovative approaches to learning willingly. However, Blinco, Mason, McLeamon, and Wilson (2004) emphasized that the success of e-learning rests essentially on the possession of adequate technical skills needed for the effective utilization of e-learning facilities by the instructors and students. Moreover, research studies have shown that e-learning enhances the nature of education and makes adaptation to the learning environment more concrete (Garrison, 2011; Gadakchyan et. al., 2020), especially for pre-service teachers in teacher education. On the other hand, in an e-learning

environment, learners' interaction is an important variable that determines a successful learning experience for the students (Cho & Kim, 2013). According to Cho and Summers (2012), learners' interaction with others and the e-learning resources enhances their satisfaction with their courses and also enhances their academic performance and social presence.

Meanwhile, teacher education refers to the professional training of teachers for the acquisition of desirable attitudes, skills, and knowledge required to make them efficient and effective in their work, in accordance with the needs of a given society at any time (Ogunyinka, Okeke & Adedoyin, 2015). Contributing, Udu (2015) noted that the initial education technology centres in the tertiary institutions were properly managed. Specifically, it was found that in most teacher education tertiary institutions, the education technology centres had ICT-based equipment such as circuit television, language laboratories, overhead projectors, radio sets, television sets, etc, needed for the provision of a high-quality ICT-based teacher education program. It is, however, sad to note that most of the equipment which could have formed the basis of the modern ICT and e-learning integration may no longer be functioning for reasons ranging from lack of maintenance, obsolescence, lack of spare parts, etc (Udu, 2015; Seifu, 2020). The author opines that forestalling the mistakes of the past requires serious efforts by the instructors and learners in embracing ICT, specifically, the e-learning resources in teacher education programs in Nigeria.

Furthermore, several empirical studies on availability, accessibility, challenges, and prospects of e-learning facilities in tertiary institutions abound. Many of these studies support innovative works in technology acceptance. For instance, a study conducted by Fayomi, Ayo, Ajayi, and Okorie (2015) investigated the impact of e-learning in facilitating students' performance among private secondary schools and tertiary institutions in Ota, Nigeria. The study found that e-learning was effective in facilitating studies significantly and improved the academic performance, learning process, and self-development of the students. Oluwalola and Awodiji (2019) conducted a study on the availability and utilization of e-learning facilities for management and business courses in universities in Kwara State. The study found that e-learning facilities were moderately available in the universities studied. A similar study by Eze, Chinedu-Eze, and Bello (2018) on the utilization of e-learning facilities in the education system of a university found that e-learning facilities were adequate, available, and well utilized by teachers in the sampled university. However, the study also found that the effective utilisation of e-learning resources was inhibited by inadequate internet facilities and inadequate training of personnel, among other things. In another study, Eze, Chinedu-Eze, Okike, and Bello (2020) evaluated the factors that influence the use of e-learning facilities by students in private universities and found that the use of e-learning was not encouraging in the institutions. Furthermore, Akanbi (2020) conducted a study on the availability and utilization of e-learning facilities in the teaching of physics in senior secondary schools in Ilorin, Nigeria, and found that almost all the e-learning facilities identified in the study were inadequate, and those available were not effectively utilized by teachers. Similarly, Atsumbe, Emmanuel,

Igwe, and Atsumbe (2012) investigated the availability and utilization of e-learning infrastructures in a Nigerian University. They found that e-learning facilities specifically designated for teaching and learning purposes were inadequate in the schools. Atsumbe et. al. noted further that although lecturers and students have limited access to the available computers/laptops and internet facilities in the schools, they were not used for teaching and learning purposes.

The above studies have made significant contributions to the availability and utilization of e-learning facilities in the teaching and learning processes in secondary schools and universities in Nigeria. However, no study was specifically conducted on the pre-service teachers in the universities. Hence, justifying this study. This current study progresses previous studies on the availability and utilization of e-learning resources for effective teaching and learning (Eze, Chinedu-Eze, & Bello, 2018; Oluwalola & Awodiji, 2019; Eze, Chinedu-Eze, Okike, & Bello, 2020), and contributes to the literature in several notable ways. This study provides helpful insights into how the availability of e-learning resources can improve pre-service teachers' utilization of the resources for innovative science education in universities. This study addresses an important research gap by highlighting the usefulness of the availability of e-learning resources in the improvement of pre-service teachers' academic performance and the acquisition of vital skills needed for professional teaching experiences in science education (Udu et al. 2022). Furthermore, this current study is novel in the sense that it assessed how availability can influence pre-service teachers' utilization of e-learning resources for innovative science education in the universities in Ebonyi State. The study argues that despite the importance of e-learning resources in enhancing the academic performance of students, the problem of inadequate availability may affect the utilization of the resources in the teaching and learning processes in Nigeria (Akanbi, 2020; Innocent & Masue, 2020). The main objective of this study, therefore, is to examine the influence of availability on pre-service teachers' utilization of e-learning resources in Nigerian universities. Therefore, to achieve the objective, the following research question was formulated to guide the study.

Research Question

1. What is the influence of availability on pre-service teachers' utilization of e-learning resources for innovative science education in Nigerian universities?

Hypothesis

The study hypothesizes that:

There is no significant influence of availability on pre-service teachers' utilization of e-learning resources for innovative science education in Nigerian universities.

Methodology

The study adopted a descriptive survey design approach. The sample was 205 final-year science education undergraduates composed of 84 males (41%) and 121 females (59%) drawn from two universities (one state and one federal) in south-eastern Nigeria using a stratified random sampling technique. The two universities were selected on the basis that they were conventional universities that have faculties of education for the training of teachers.

The undergraduates' ages ranged from 19 to 23 years (M = 20.30, SD = 3.2). The undergraduates were selected from biology education, 81 (39%), chemistry education, 72 (35%), physics education, 32 (15%), and mathematics education, 23 (11%). The instrument for data collection was a researcher-made structured questionnaire with a four-point rating scale of Very Much Available (VMA), Moderately Available (MA), Scarcely Available (SA), and Not Available (NA) for availability; and Frequently Utilized (FU), Moderately Utilized (MU), Seldomly Utilized (SU), and Never Utilized (NU) for utilization of e-learning resources (Bada & Jita, 2021). These scales were weighted 4, 3, 2, and 1 for each of the clusters. The structured questionnaire had two parts: 1 and 2; part 1 sought information on the bio-data of the respondents, while part 2 contained fifteen (15) e-learning resources, to determine their extent of availability and utilization in two clusters. The instrument was validated by three experts in science education, while the reliability was determined from a pilot study conducted on thirty pre-service teachers randomly selected from equivalent universities in south-southern Nigeria who were not part of the study. The results of Cronbach's alpha reliability estimate showed indices of 0.76 and 0.78 for clusters A and B, respectively, with an overall index of 0.77 for all the clusters put together. This was considered high enough for the study (Bruce & Edward, 2003). All 205 copies of the questionnaires were distributed to the respondents by the researchers, with the assistance of the respective course representatives of the students in the two universities. All the questionnaires were returned, giving a 100% return rate. Mean, with standard deviation, was used to analyse the research questions, while the hypothesis was tested using the Paired sample t-test statistics. The analyses were computed using the statistical package for the social sciences (SPSS) software. The decision rules were as follows: any item with a mean score less than 1.50 was interpreted as "Never Available (NA)", and "Never Utilized (NU)" accordingly; 1.50 – 2.49 as "Rarely Available (RA)", and "Rarely Utilized (RU)" accordingly; 2.50 – 3.49 as "Occasionally Available (OA)", and "Occasionally Utilized (OU)" accordingly; and 3.50 – 4.00 as "Always Available (AA)", and "Mostly Utilized (MU)" accordingly (Bada & Jita, 2021). For the hypothesis, the alpha level was set at $p < 0.05$. Therefore, if a p-value was less than 0.05, the null hypothesis was rejected, but if greater than or equal to 0.05, the null hypothesis was accepted (Navarro-Patón et. al. 2020).

Presentation of Results

The results are presented in tables according to the research questions and hypotheses. **Research Question 1:** What is the influence of availability on pre-service teachers' utilization of e-learning resources for innovative science education in Nigerian universities?

Table 1: Mean and Standard Deviation Scores of Pre-service Teachers' Responses on the Extent of Availability and Utilization of E-learning Resources

S.N	E-learning Resources	N	Availability			Utilization		
			Mean	SD	Deci.	Mean	SD	Deci.
1	Desktop Computers	205	2.70	1.05	OA	2.65	1.05	OU
2	Laptop, palmtop, microcomputers	205	2.67	1.04	OA	2.60	1.07	OU
3	Scanners	205	2.08	1.05	RA	1.70	0.91	RU
4	Printers	205	2.63	1.05	OA	2.61	1.02	OU
5	Interactive boards	205	2.40	1.05	RA	1.74	0.84	RU
6	Digital camera/Camcorder	205	2.00	1.02	RA	1.97	0.89	RU
7	Internet and e-mail facilities	205	2.60	1.11	OA	2.73	1.03	OU
8	Multimedia projector system	205	2.40	1.04	RA	2.56	1.04	OU
9	E-readers/e-books	205	2.33	1.06	RA	1.99	1.02	RU
10	CD-ROM, Flash drives, etc.	205	2.53	1.06	OA	2.58	1.08	OU
11	Digital/internet library	205	2.46	1.08	RA	2.47	1.10	RU
12	Digital Laboratory	205	1.67	0.91	RA	1.58	0.75	RU
13	Educational Direct Broadcast Satellite (EDBS)	205	1.71	0.91	RA	1.32	0.71	NU
14	Bluetooth and other data transfer devices	205	2.50	1.11	OA	2.79	0.96	OU
15	Educational Digital Satellite Systems (EDSS)	205	1.74	0.94	RA	1.48	0.83	NU
	Total Availability & Utilization of E-learning Resources	205	2.29	0.98	RA	2.19	0.88	RU

Table 1 contains the mean and standard deviation scores of the pre-service teachers' opinions on the extent of availability and utilization of e-learning resources for innovative science education in Nigerian universities. The table shows that the pre-service teachers generally indicated that most e-learning resources in their universities were rarely available (RA) for innovative science education, as evidenced by the overall mean with a standard deviation score of 2.29 ± 0.98. Meanwhile, the table also shows that some e-learning resources, such as desktop computers, laptops, palmtops, microcomputers, printers, and internet with e-mail facilities were occasionally available (OA). Similarly, the table shows that the pre-service teachers rarely utilized (RU) the identified e-learning resources for innovative science education, as evidenced in their overall mean with a standard deviation score of 2.19 ± 0.88. However, the table shows further that some e-learning resources such as desktop computers, laptops, palmtops, microcomputers, printers, internet with e-mail facilities, multimedia projector systems, courseware packages (CD-ROM, flash drives), Bluetooth, and other data transfer devices, were occasionally utilized, while Educational Direct Broadcast Satellite and Educational Digital Satellite Systems were never utilized (NU).

These results show that the pre-service teachers indicated that e-learning resources were rarely available and utilized for innovative science education in the universities. However, it could not be established from the table whether availability influences pre-service teachers' utilization of e-learning resources in the universities. Hence, the results were subjected to inferential testing of the null

hypothesis with Paired sample t-test statistics as shown in Table 2 below.

Ho$_1$: There is no significant influence of availability on pre-service teachers' utilization of e-learning resources for innovative science education in Nigerian universities.

Table 2: Summary of Paired Sample t-test on the Influence of Availability on Pre-service Teachers' Utilization of E-learning Resources

	Paired Differences							
				95% CID				
	Mean	SD	SEM	Lower	Upper	t	df	Sig. (2-tailed)
Availability of E-learning – Utilization of E-learning	0.11	0.16	0.01	0.08	0.13	9.60	204	0.00

(SD = Standard deviation; SEM = Standard Error Mean; CID = Confidence Interval of the Difference)

Table 2 contains the summary of the results of a paired sample t-test that tested the null hypothesis. From the Table, the t-value was 9.60 and the sig. (p-value) was 0.00, which was less than the 0.05 set for the study. Also, the confidence interval of the difference was from 0.08 as the lower bound to 0.13 as the upper bound. Based on these results, the null hypothesis, which states that there is no significant influence of availability on pre-service teachers' utilization of e-learning resources for innovative science education in Nigerian universities, was therefore rejected, which implies that there was a significant influence of availability on the pre-service teachers' utilization of e-learning resources for innovative science education in Nigerian universities. This implies that the more e-learning resources are available, the more pre-service teachers utilize them for innovative science education in Nigerian universities.

Discussion of Findings

The findings of this study show that the pre-service teachers revealed that e-learning resources were rarely available in the universities. This result shows that most of the e-learning resources outlined in this study were rarely available for innovative science education in universities. This finding agrees with Oluwalola and Awodiji (2019), who found that most e-learning resources are not usually available in schools and have affected the learners' and teachers' use of the resources for teaching and learning purposes.

The findings of this study also revealed that pre-service teachers rarely utilized the identified e-learning resources for innovative science education in the universities. This finding is consistent with the findings of Akanbi (2020), Eze et. al. (2020), and Innocent and Masue (2020) that most e-learning resources found in schools are rarely utilized by the students and teachers.

Furthermore, this study found a statistically significant influence of availability on pre-service teachers' utilization of e-learning resources for innovative science education in the universities. The finding implies that the more e-learning resources are available, the more the pre-service teachers utilize them for innovative science education. This

result aligns with the findings of previous researchers, such as Nwana et al. (2017), Akonbi (2020), and Eze et al. (2020), that availability influences the utilization of e-learning (ICT) facilities in schools. The findings of this study have shown that the utilization of e-learning resources for effective science education is dependent on the availability of such resources.

Conclusion

This study assessed the influence of availability on pre-service teachers' utilization of e-learning resources for innovative science education in Nigerian universities. The study established that e-learning resources were rarely available and utilized for innovative science education in universities. The low level of utilisation of these e-learning resources could be attributed to the non-availability of the resources in the universities (Akonbi, 2020; Eze, et. al. 2020). The non-availability of e-learning resources in universities has been a major hindrance to innovative science education in the developing nations of the world (Cao et al. 2013; Eze et al. 2018; Bouton et al. 2020). This study, therefore, concludes that for effective implementation of innovative science education, e-learning resources must be available and effectively utilized by the pre-service teachers in Nigerian universities.

Recommendations

The study, therefore, recommends that the university management and other stakeholders in education should prioritize the provision of e-learning resources in universities. This is to ensure the availability and effective utilization of the resources for effective innovative science education. The pre-service teachers of the universities should utilise the available e-learning resources more often for effective, innovative science education in the universities. Finally, **t**he pre-service teachers should be assisted by the government through the Tertiary Education Trust Fund (TETFund) to procure e-learning facilities to enhance their effectiveness in the use of the resources for innovative science education in universities.

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