

AWARENESS AND UTILIZATION OF E-LEARNING TOOLS FOR EDUCATIONAL PURPOSES BY SCIENCE EDUCATION STUDENTS' OF NNAMDI AZIKIWE UNIVERSITY, AWKA

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Abstract

This study investigated awareness and utilization of e-Learning tools for educational purposes by science education students' of Nnamdi Azikiwe University, Awka. Four research questions guided the study. The design of the study was descriptive survey research design. The population of the study was 937 science education students of Nnamdi Azikiwe University, Awka as at 2023/2024 academic session. Stratified and Simple random sampling technique was used to draw 105 science students from the six options in the department. The instruments used for data collection was a checklist and questionnaire titled: awareness and utilization of e-learning tools for educational purposes (AUETEP) developed by the researcher. These instruments were validated by two experts from Science Education Department of Nnamdi Azikiwe University, Awka and one from Measurement and Evaluation Faculty of education of the same university. Reliability was carried out using Cronbach alpha which yielded a reliability coefficient of 0.81 and 0.86 respectively, indicating that the instrument was reliable. Research questions' were answered using percentages, frequencies and mean scores. Thereafter, the findings revealed that science education students' of Nnamdi Azikiwe University (NAU) are aware of all the e-learning tools listed in the study. The result equally revealed that science education students of NAU do not utilize all the e-learning tools listed in the study for educational purposes. In addition, science education students' of Nnamdi Azikiwe University agreed on the listed challenges in the study as the challenges encountered in the utilization of e-learning tools for educational purposes. Furthermore, the respondents agreed on most of the solutions to the challenges listed in the study. The researchers' concluded that the students are aware of the e-learning tools but do not utilize them for educational purposes. It was recommended among others that University management and department should develop a clear e-learning strategy such as creating policies that support the use of e-learning tools, including guidelines for implementation and best practices, invest on reliable internet and equipment as well as learning management systems (LMS).

Key words: Awareness, Utilization, e-learning tools, educational purposes, Science education.

Introduction

In recent years, the integration of emerging technologies into education has become increasingly prevalent and revolutionizing traditional learning approaches across various disciplines. Among these advancements, the field of undergraduate science education stands out

as a focal point for exploration and implementation. The rapid evolution of technology has presented educators and students alike with an array of innovative tools and platforms to enhance teaching and learning experiences (Almenara et al 2013). From virtual reality simulations to artificial intelligence-driven adaptive learning systems, the landscape of educational technology continues to expand, offering new possibilities for engagement and knowledge acquisition. However, despite the potential benefits, the effective integration of emerging technologies into science education curriculum requires a comprehensive understanding of students' awareness, attitudes, and usage patterns (Ogunla, 2013).

Emerging technology refers to innovations that are in the early stages of development and have the potential to significantly impact various aspects of society. These technologies often represent cutting-edge advancements in fields such as artificial intelligence, biotechnology, nanotechnology, e-learning, robotics, quantum computing, and renewable energy. Emerging technologies are characterized by their rapid evolution, high levels of uncertainty, and the potential for disruptive change (Olasina, 2023). The usefulness of emerging technology cannot be overemphasized especially in Science education.

Science education encompasses the teaching and learning of scientific concepts, principles, and methodologies. It aims to equip individuals with the knowledge, skills, and attitudes necessary to understand the natural world, make informed decisions, and participate effectively in scientific inquiry (Enebechi, 2021). Science education spans a wide range of subjects including physics, chemistry, biology, earth science, astronomy, and environmental science. It encompasses both formal education in schools and informal learning experiences outside the classroom (Queendaline *et al* 2022). Emerging technology and science education refers to the intersection of these two domains which includes incorporating emerging technologies into science education curriculum and pedagogy to enhance learning experiences, foster scientific literacy, and prepare students for the challenges and opportunities of the future (Udende and Azeez, 2010). It also involves exploring how advances in science education can support the development and adoption of emerging technologies by cultivating a skilled workforce and promoting innovation and entrepreneurship in the fields of Science, Technology and Mathematics (STEM). The focus of this study is e-learning as a branch of emerging technologies.

From the researchers' point of view, e-Learning tools are specific applications or resources designed to facilitate learning through digital means. They include platforms and software such as learning management systems (LMS), online course platforms, digital textbooks, educational apps, and interactive simulations. E-learning tools are a subset of technology specifically tailored to enhance the learning experience and support educational activities. Ghirardini (2011) defined e-learning as the use of computer and internet technologies to deliver a broad array of solution to enable learning and improve performance. According to Yekini et al (2020) e-learning tools have the ability to offer and share materials in all kinds of formats as e-mails, slideshows, videos, PDFs, and word documents. Raheem & Khan, (2020) also emphasized that e-learning is also enabled when conducting webinars (live online class), communication with teachers via message and chat forum. E-learning, encompassing a broad range of electronic and digital technologies, offers dynamic and interactive platforms for content delivery, assessment, and collaboration (Ojukwu, Agim & Ameh, 2021). E-learning tools are seen as digital methods of learning rather than face to face contact. Note however that while e-learning tools can incorporate emerging technologies, not all emerging technologies are e-

learning tools. Emerging technologies can enhance or create new e-learning tools, but e-learning tools themselves are a more focused category within the broader landscape of technology.

The benefits of introducing e-learning tools for educational purposes are numerous for both students and educators. Adedoyin and Ogunsola (2016) enumerated so many benefits of e-learning tools: Firstly, it provides interactive learning: E-learning tools can provide interactive simulations, virtual experiments, and multimedia resources that make science concepts more engaging and accessible. This interactivity can enhance understanding and retention of complex scientific principles. E-learning tools can be accessed anytime, anywhere, making science education more flexible and accommodating to diverse learning styles and schedules. This accessibility is particularly valuable for students who may not have access to traditional laboratory equipment or resources. E-learning platforms often offer adaptive learning features that tailor content and instruction to individual student needs and abilities. This personalization can help students learn at their own pace and address their specific learning challenges more effectively. Many e-learning tools facilitate collaboration among students through discussion forums, group projects, and shared resources. Collaborative learning experiences encourage active participation, peer learning, and the development of teamwork skills. E-learning tools can incorporate real-world data, case studies, and examples that demonstrate the relevance of science concepts to everyday life and future careers. This connection to real-world applications can motivate students and deepen their understanding of scientific concepts. E-learning platforms often include built-in assessment tools that enable educators to monitor student progress, identify areas of difficulty, and provide timely feedback (Abhilasha and Vikramjit 2020). This data-driven approach to assessment can help educators tailor instruction and support student learning more effectively. E-learning tools can reduce the need for expensive laboratory equipment and materials, making science education more affordable and accessible to schools and students with limited resources.

Introducing e-learning tools in science teaching can enhance the quality, accessibility, and effectiveness of science education by leveraging technology to create engaging, interactive, and personalized learning experiences. Therefore, teaching Science through e-learning tools can be considered an abridged learning process which is an alternative to classroom or physical contact. With a view of improving effective learning of Science in schools, students are supposed to have adequate awareness of e-learning tools and knowledge of how they function for proper utilization.

Awareness is to be knowledgeable of something. According to Trevethan (2017) awareness is the familiarity, knowledge or understanding of someone or something, such as facts, information, descriptions or skills, which is acquired through experience or education by perceiving, discovering or learning. Awareness can refer to a theoretical or practical understanding of a subject (Pathmanathan & Lakshmanan, 2014). It is the access to knowledge or existence of a process or activity.

Utilization is the act of using a tool or resources. Izuagbe, (2018) reports that utilization connotes the adoption and effective application of a tool that will support or assist in achieving a goal or objectives. With respect to e-learning tools, students who use them tend to be more effective in their learning task. Science students have a major role to play in the effort to ensure the utilization of e-learning tools for effective learning (Jephcote & Salisbury, 2019). Schools have to ensure that e-learning tools are available and present in the school to ensure effective use by the students in their science learning. Science subjects' being the key to economic

advancement requires effective utilization of e-learning tools for learning so as to foster students' understanding of complex science concepts. The use of e-learning tools has the potential to transform science classrooms.

Dennen (2015) observed that e-learning can lead to increased student engagement, better understanding of concepts, and improved academic performance. As such, students' worldwide engage in the integration of e-learning tools to create more student-centered and technology-rich learning environments. Ayeni and Adebisi (2017) reported that technology integration in Nigerian classrooms has the potential to enhance teaching effectiveness and student learning outcomes. Adequate teacher preparation and access to suitable teaching resources, including e-learning tools, are essential to create a positive and enriching learning environment. Furthermore Oluwatayo and Oloruntegbe (2015) highlighted the importance of both science students and teachers to keep pace with innovative teaching approaches, including the integration of technology. Science students' awareness and beliefs play a crucial role in the successful adoption and utilization of e-learning tools. This is why Teo (2019) posited that students' awareness of technology can influence their willingness to embrace it in their instructional practices. Positive awareness can lead to perceived usefulness and ease of use which are associated with higher adoption rates.

However, despite the potential benefits, there are challenges that Nigerian Science students may face in utilizing e-learning tools. Obot and Udousung (2018) identified some of these challenges as limited access to technology, inadequate training, and concerns about the relevance and appropriateness of digital resources. Conversely, negative perceptions or lack of awareness may hinder the effective incorporation of e-learning tools in the classroom and will affect students learning in most tertiary Institutions. Understanding these challenges is critical to developing targeted strategies to support science students' in effective utilization of e-learning. Despite the growing interest in e-learning tools globally, there is a dearth of research on their specific implementation, awareness and impact in most tertiary institutions particularly in the context of utilization by science students. The focus of this study therefore is on awareness and utilization of e-Learning tools for educational purposes by science education students' of Nnamdi Azikiwe University, Awka.

Statement of the Problem

In the digital age, e-learning tools have become essential for enhancing educational experiences and improving learning outcomes. These tools, ranging from online courses and digital textbooks to interactive simulations and collaborative platforms, offer numerous benefits for students, particularly in specialized fields like science education. Despite their potential advantages, there is a concern that science education students at Nnamdi Azikiwe University, Awka, may not be fully aware of or utilizing these e-learning tools to their maximum potential. Preliminary observations and informal feedback suggest that a gap exists between the availability of e-learning resources and their effective use by students. Factors contributing to this gap may include a lack of awareness about the tools, insufficient training on how to use them, or inadequate support from the institution. Consequently, this underutilization could hinder students' academic performance, limit their access to current scientific knowledge, and impact their readiness for modern educational and professional environments. This study aims to investigate the awareness and utilization of e-learning tools among science education students at Nnamdi Azikiwe University, Awka. It seeks to identify the level of awareness, the extent of

utilization, and the factors influencing these aspects. Understanding these dynamics will provide insights into how to better support students in leveraging e-learning tools effectively, ultimately enhancing their educational experience and outcomes.

Purpose of the Study

The main purpose of the study was to ascertain science education students' awareness and utilization of e-learning tools for educational purposes in Nnamdi Azikiwe University, Awka. Specifically, the study sought to ascertain:

1. e-learning tools science education students of Nnamdi Azikiwe University are aware of.
2. e-learning tools science education students of Nnamdi Azikiwe University utilize for educational purposes.
3. Challenges encountered by Science education Students of Nnamdi Azikiwe University in the utilization of e- learning tools for educational purposes.
4. Solutions to the challenges experienced by science education students of Nnamdi Azikiwe University in the utilization of e-learning tools for educational purposes.

Research Questions

The following research questions guided this study:

1. What e-learning tools are science education students of Nnamdi Azikiwe University aware of
2. What e-learning tools do science education students of Nnamdi Azikiwe University utilize for educational purposes?
3. What challenges do science education students of Nnamdi Azikiwe University encounter in utilizing e- learning tools for educational purposes?
4. What are the solutions to the challenges encountered in the utilization of e-learning tools for educational purposes by science education students of Nnamdi Azikiwe University?

Method

The research design for this study was descriptive survey research design. According to Nworgu (2015), a survey research design is one in which a group of people or items are being studied by collecting and analyzing data from only a few people or items considered to be representative of the entire population. The population of the study was 937 science education students of Nnamdi Azikiwe University, Awka as at 2023/2024 academic session. A sample size of 105 science education students was used for the study. The sampling techniques used for the study were the stratified random sampling. This sampling technique was adopted because the population was divided into homogeneous groups known as strata based on course and level of study and samples were drawn from each stratum using the simple random sampling technique. The stratification ensures that each type of the population member is included in the sample and hence yields higher precisions even though the total number of people in each stratum may vary. Instruments used for data collection was a checklist and questionnaire titled: Awareness and utilization of e-learning tools for educational purposes (AUETEP) developed by the researchers'. The checklist has a total of 15 e-learning tools for educational purposes with two options of aware and not aware addressing research question 1, utilized (U) and not utilized (NU) addressing research question 2. A questionnaire was employed for data collection for research questions 3 and 4. A modified four point liker scale

was used: strongly agree (SA), Agree (A), Disagree (D), and strongly disagree (SD). These were weighed 4, 3, 2 and 1 point respectively. The instruments were validated by two experts from Science Education Department of Nnamdi Azikiwe University, Awka and one from Measurement and Evaluation Faculty of education of the same university. A trial testing of the instrument was carried out by administering the instrument to 20 science education students of Enugu State University of Science and Technology. The Cronbach Alpha was used to determine the reliability of the instruments. Reliability co-efficient of 0.81 and 0.86 respectively was obtained, an indication that the instrument was reliable for data collection. In distributing the copies of the questionnaire, the researchers' with two trained research assistants adopted the technique of on-the-spot distribution and collection. This ensured a 100% return rate. Data collected were analysed using Frequency counts, percentages and mean scores. For analyzing research questions 1 and 2 the rule of thumb states that any percentage from 50% and above was considered "Aware (A)" or "Utilized (U)" while a percentage value below 50% was considered as "Not Aware (NA)" or "Not utilized (NU)". For research questions 3 and 4, any mean score between 2.50 and above was regarded as "agree" while below 2.50 was regarded as "Disagreed".

Results

The results from research questions were presented below.

Research Question 1:

Table I: Frequency counts and Percentage scores of e-Learning tools science education students of Nnamdi Azikiwe University are aware of for educational purposes

| S/N | ITEMS | Aware | | Not Aware | | Decision |
|-----|---------------------------------|-------|-------|-----------|-------|----------|
| | | F | % | F | % | |
| 1 | Social network media | 101 | 96.19 | 4 | 3.81 | Aware |
| 2 | Video conferencing tools | 105 | 100 | 0 | 0 | Aware |
| 3 | Learning management system | 88 | 83.80 | 17 | 16.19 | Aware |
| 4 | Moodle | 76 | 72.38 | 29 | 27.62 | Aware |
| 5 | Online assessment tools | 103 | 98.10 | 2 | 1.90 | Aware |
| 6 | Wide area network (WAN) | 104 | 99.05 | 1 | 0.95 | Aware |
| 7 | E-mail | 105 | 100 | 0 | 0 | Aware |
| 8 | Discussion forums | 103 | 98.10 | 2 | 1.90 | Aware |
| 9 | Collaborative software | 90 | 85.71 | 15 | 14.29 | Aware |
| 10 | Classroom management software | 75 | 71.43 | 30 | 28.57 | Aware |
| 11 | Team learning systems | 82 | 78.10 | 23 | 21.90 | Aware |
| 12 | Satellite delivered learning | 91 | 86.67 | 14 | 13.33 | Aware |
| 13 | Interactive whiteboard software | 84 | 80 | 21 | 20 | Aware |
| 14 | Virtual education network | 77 | 73.33 | 28 | 26.67 | Aware |
| 15 | Mobile learning platform | 105 | 100 | 0 | 0 | Aware |

Table 1 shows that the percentage scores for all 15 e-learning tools were over 50%. This means that science education students' of Nnamdi Azikiwe University are aware of these e-learning tools for educational purposes

Research Question 2

Table 2: Percentage scores on the E-Learning tools science education students of Nnamdi Azikiwe University utilize for educational purposes

| S/N | ITEMS | Utilized | | Not Utilized | | Decision |
|-----|----------------------|----------|------|--------------|-------|--------------|
| | | F | % | F | % | |
| 1 | Social network media | 1 | 1.95 | 104 | 99.05 | Not Utilized |

| | | | | | | |
|----|---------------------------------|---|------|-----|-------|--------------|
| 2 | Video conferencing tools | 2 | 1.90 | 103 | 98.10 | Not Utilized |
| 3 | Learning management system | 0 | 0 | 105 | 100 | Not Utilized |
| 4 | Moodle | 2 | 1.90 | 103 | 98.10 | Not Utilized |
| 5 | Online assessment tools | 4 | 3.80 | 101 | 96.20 | Not Utilized |
| 6 | Wide area network (WAN) | 1 | 0.95 | 104 | 99.05 | Not Utilized |
| 7 | E-mail | 1 | 0.95 | 104 | 99.05 | Not Utilized |
| 8 | Discussion forums | 0 | 0 | 105 | 100 | Not Utilized |
| 9 | Collaborative software | 0 | 0 | 105 | 100 | Not Utilized |
| 10 | Classroom management software | 0 | 0 | 105 | 100 | Not Utilized |
| 11 | Team learning systems | 0 | 0 | 105 | 100 | Not Utilized |
| 12 | Satellite delivered learning | 0 | 0 | 105 | 100 | Not Utilized |
| 13 | Interactive whiteboard software | 0 | 0 | 105 | 100 | Not Utilized |
| 14 | Virtual education network | 0 | 0 | 105 | 100 | Not Utilized |
| 15 | Mobile learning platform | 3 | 2.85 | 102 | 97.14 | Not Utilized |

Table 2 shows that the percentage scores for all the 15 e-learning tools were over 50%. This means that science education students' of Nnamdi Azikiwe University do not utilize these e-learning tools for educational purposes

Research Question 3:

Table 3: Respondents mean ratings on challenges encountered by science education students of Nnamdi

| S/N | ITEM: Challenges of utilizing e-learning | Mean | Decision |
|-----|--|------|----------|
| 1. | Internet connection issues | 3.45 | Agree |
| 2. | Physical and mental presence/ stress | 3.20 | Agree |
| 3. | Lack of familiarity with technology | 3.00 | Agree |
| 4. | Physical fatigue | 2.80 | Agree |
| 5. | Lack of space for data storage | 3.50 | Agree |
| 6. | Students shyness | 3.40 | Agree |
| 7. | Lack of equal accessibility | 2.80 | Agree |
| 8. | Erratic power failure in schools | 3.45 | Agree |
| 9. | Finding a suitable place for learning | 2.70 | Agree |

Azikiwe University in utilizing e- learning tools for educational purposes

Table 3 shows that the nine possible challenges listed have mean scores above the cut-off mean of 2.50. This indicates that science education students of Nnamdi Azikiwe University agreed that they encounter the listed challenges in utilization of e-learning tools for educational purposes

Research Question 4:

| S/N | ITEM | Mean | Decision |
|-----|--|------|----------|
| 1. | Good funding should be provided for purchasing the resources needed to drive the use of the e-learning tool such as internet facilities | 3.50 | Agree |
| 2. | Students are encouraged to have enough rest and give themselves a break since the use of e-learning tools can be stressful this will help to reduce the physical and mental health challenges. | 2.70 | Agree |
| 3. | School technologies should be employed to periodically assist students during usage of e-learning tools | 3.10 | Agree |
| 4. | Science students should be motivated so as to increase their interest in using the e-learning tools for learning of science subjects | 3.45 | Agree |
| 5. | Provision of smart phones, funds, laptops and computers with high storage | 2.30 | disagree |

| | | | |
|----|---|------|-------|
| | capacity for storing data. | | |
| 6. | Students should be taught on how to use most of the e-learning tools to avoid shying away from them. This can be done through periodic workshops and seminars | 3.30 | Agree |
| 7. | E-learning tool should be made accessible to science students in the school. | 3.00 | Agree |
| 8. | Standby power source should be provided in the schools | 3.20 | Agree |
| 9. | Science students should engage on excursions, online quiz, seminars and conferences to acquire new practical skills in using E- learning tool | 3.40 | Agree |

Table 4: Respondents mean ratings on the solutions to the challenges encountered in the utilization of e-learning tools learning by science education students of Nnamdi Azikiwe University

Table 4 revealed that the respondents agreed on most of the solutions to the challenges listed, this is indicated in items 1,2,3,4,6,7,8 and 9 which scored above the mean rating of 2.5%. The respondents' only disagreed in item 5 which scored below the mean.

Discussion of Findings

The findings of this study on students' awareness of e-learning tools show that science education students of Nnamdi Azikiwe University Awka are aware of all the e-learning tools in the study. The results are consistent with Olasina's (2012) study of students' e-learning experiences in Nigerian universities, which found that students had a high awareness of e-learning resources. The results align with the research conducted by Fabumni (2012), who examined undergraduate students' awareness of ICT resources in Ekiti State University and discovered that the students are cognizant of the use of media technologies in the classroom. The results are consistent with research reports by Anejo (2007), who used National Teachers Institute (NTI) students in a study and discovered that they are aware of emerging instructional technologies.

The findings of this study on students' utilization of e-learning tools shows that science education students' of Nnamdi Azikiwe University do not utilize all the e-learning tools in the study for learning science. This result is in line with the study of Ayub and Hussain (2019) who in their findings showed that most of the e-learning tools may be available for the students but they are not utilized in learning of science concepts. The results are consistent with the findings of Lovillard (2008), who examined how students used new technologies in the classroom and discovered that students were unable to use computers for online writing and submission of assignments, as well as for collaborative learning and feedback. The results also align with the findings of Olibie and Akudolu (2009), who examined the digital empowerment of youth in higher education in south eastern Nigeria and discovered that a small percentage of students used virtual resources and that it might take 30 years for Nigerian students to catch up with even South Africa and 50 years to catch up with the United States. Furthermore, the findings agree with the position of Hamzah, et al (2019) that in many higher institutions of learning, e-learning tools are not provided for learning of science courses, and students are not interested in using the e-learning tools for learning of science courses due to their lack of skills and cost of data.

The findings of the study showed that science education students of Nnamdi Azikiwe University agreed on the listed challenges in the study as the challenges encountered in the utilization of e-learning tools in learning. This result is in line with that of Enebechi and Iyoke (2022) who reported that lack of provision of e-learning tools, poor funding to procure the e-learning tools, and erratic power failure in tertiary institution were the challenges students face in the use of on-line teaching pedagogy for learning of science courses in tertiary institutions.

Finally, the findings revealed that the respondents agreed on most of solutions to the challenges listed in the study. This result is in line with the study of Khan and Khan (2019) who found that adequate funding can be a very good solution to the myriad of issues faced by the science students in the use of e-learning tools for learning of science courses. Nwosu and Onyishi (2014) also supported this finding when they stated that the e-learning tools should be sufficient for learning of science courses in schools and that good funding should be provided for purchasing the resources needed to drive the use of the e-learning tool for teaching and learning of science courses.

Conclusions of the findings

Based on the analyses made above, the following conclusions were drawn:

1. Science education students of Nnamdi Azikiwe University are aware of all the e-learning tools listed in the study.
2. Science education students' of Nnamdi Azikiwe University do not utilize all the e-learning tools listed in the study for learning science.
3. Science education students of Nnamdi Azikiwe University agreed on the listed challenges in the study as the challenges encountered in the utilization of e-learning tools in learning.
4. The respondents agreed on most of the solutions to the challenges listed in the study.

In conclusion, the awareness and utilization of e-learning tools by science education students of Nnamdi Azikiwe University are crucial for advancing education in the digital age.

Recommendation of the Study

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

1. Government should allocate adequate funding to schools to acquire necessary e-learning tools (hardware & software) and internet infrastructure to support their e-learning adoption/ and utilization.
2. Departments should promote adoption of blended learning and adaptive learning: combining traditional classroom teaching with online components to maximize flexibility and accessibility. Use e-learning tools that allow for personalized learning experiences, adapting to the individual needs and pace of students.
3. University management and department should develop a clear e-learning strategy such as creating policies that support the use of e-learning tools, including guidelines for implementation and best practices, invest on reliable internet and equipment, learning management systems (LMS).
4. Provide training and support for faculty development by offering regular training sessions and workshops to help faculty become proficient in using e-learning tools and integrating them into their teaching methods, provide orientation and ongoing support to students to familiarize them with the e-learning platforms and tools available.

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