SELF-CONCEPT AND USE OF E-LEARNING TECHNOLOGIES AMONG SCIENCE EDUCATION STUDENTS IN COLLEGES OF EDUCATION IN KWARA STATE, NIGERIA

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Abstract

This study examined the self-concept and use of e-learning technologies among Science Education students in colleges of education in Kwara State, Nigeria. The population comprised all 415 second-year (200-level) science education students from four government-owned colleges of education. A stratified random sampling technique was used to select 184 students from two colleges. A validated, researcher-designed questionnaire (Cronbach's α = 0.84 for self-concept, 0.72 for use of e-learning) served as the instrument. Mean and standard deviation answered four research questions, while independent t-tests tested two null hypotheses at α = 0.05. Findings revealed that students' self-concept of e-learning was high (grand mean = 2.80 on a 4-point scale), and their use of e-learning technologies was positive (grand mean = 2.64). No significant gender differences were found in either self-concept (t(182)=1.011, p>.05) or technology use (t(182)=0.682, p>.05). The study recommends that science education students be encouraged to use e-learning technologies for instructional purposes, and that the NCE curriculum be revised to incorporate e-learning competencies.

Keywords: College of Education, E-learning, Science students, Self-Concept, E-learning Technologies

Introduction

Science is widely regarded as the driving force behind modern development, bridging technological innovation and socioeconomic advancement. Meanwhile, Science Education serves as a fundamental pillar for national progress, propelling advancements across various fields. It is recognised as essential for a nation's development and must be prioritised at all levels of education (Olamoyegun, 2023). The primary aim of science education is to cultivate scientifically literate individuals who possess strong competencies in rational thinking and decision-making (Ebele, 2019). This literacy has the transformative potential not only to reshape individual thinking but also drive societal change. Dajal et al (2018) described science education as a discipline focused on the dissemination of scientific content, aspects of social science, and the methodologies of teaching science. Its goal is to foster deeper understanding of science and integration of learners into the scientific community. In science education, e-learning has fostered more interactive, learner-centered classrooms, providing an environment that enhances motivation, reduces anxiety, and promotes practical engagement (Dajal et al, 2018).

Schutt and Linegar (2020) affirmed that in a recent time, the COVID-19 pandemic transformed education, ushering in e-learning, also known as virtual learning, as a permanent fixture, often integrated with traditional methods in a Blended Learning model. This approach, combining face-to-face and online components, offers flexibility and control for instructors and learners. E- learning does not have a single definition, as new systems for this type of learning are constantly emerging, with learners continuously adopting tools like virtual learning platforms and other internet-supported applications. The term e-learning also known as virtual learning is a teaching and learning environment or a shared online learning space that facilitates meaningful interaction, communication, view and engagement with learning resources between students and materials, students and lecturers. It promotes exchange of meaningful ideas together at the same time all in an online setting. In this setting, both students and teachers participate virtually. This interaction occurs through digitally delivered content, network-based services, and tutoring support, often utilising various online tools and media, such as the internet, intranets, extranets, simulations, games, virtual worlds, cloud services, satellite broadcasts, and web platforms (Pelet & Lecarte, 2018). Unlike traditional classroom learning, e-learning expands beyond physical walls, leveraging internet facilities, platforms, satellite links, and related systems to access, analyse, create, exchange, and apply data, information, and knowledge in innovative ways. More broadly, E-learning is a shared online space that fosters meaningful interactions among students, teachers, and peers, allowing the exchange of ideas and collaboration in real-time within a digital environment. Students can access vital materials through virtual learning resources such as online courses, e-books, simulations, and video-conferencing.

Adesoji (2022) defined e-learning technologies as computer, ICT materials and applications, which aid information collection and dissemination, research and global exchange of ideas that are critical for advancing meaningful, educational initiatives and understanding issues related to global development. E-learning takes place through online courses, web-based training, and technology-enabled instruction known as e-learning technologies. E-learning technology is essentially a collection of tools designed to facilitate student's learning via an internet connection or other multimedia tools.

Suleiman and Abubakar (2025) stressed that the integration of e-learning technologies in Nigerian tertiary institutions has transformed traditional classroom instruction into flexible, technology-driven education model which are used to enhance teaching and learning. These environments are flexible and interactive, allowing students to engage with other learners and access a wide range of resources. E-learning, in particular, allows students to choose when and where they engage with their coursework, making it an ideal option for those seeking a fully online education. It is highly interactive, often mirroring classroom environments with schedules, rosters, course content, and instructor-led guidance. Students have access to a variety of virtual learning resources, including live and recorded lectures, and engage in online discussions with instructors and peers.

Katcha and Dajal (2025) asserted that the e-learning emerged as a critical tool, enabling real-time collaboration between educators and students while transcending the barriers of time and space. E-learning technologies, encompassing online platforms, multimedia tools, and digital content, have transformed traditional teaching methodologies. These resources enhance accessibility, flexibility, and interactivity, enabling students to engage actively with educational materials. Students can utilise various tools for managing group activities, submitting assignments, and participating in assessments while enhancing their overall learning experience. The convenience, time efficiency and cost-effectiveness of E-learning technologies are driving its adoption, enabling instructors to update, assign appropriate materials rapidly and tailor their teaching to meet students' needs and help them achieve their learning objectives (Rahayu & Wirza, 2020). Notable examples of these technologies range from platforms like Khan Academy, Coursera, YouTube, Study.com and CK-12. The availability of such resources enhances the flexibility and accessibility of education, allowing learners to engage with content from virtually anywhere with internet access (Rahayu & Wirza, 2020).

Vo et al (2017) opined that e-learning technologies provide tools for administration, communication, and assessment, including features for managing student groups, uploading content, conducting assessments, and tracking progress. These tools facilitate greater interaction and engagement, enabling students to learn both through content and practical activities. Key advantages such as convenience, time savings, and cost reduction contribute to the widespread adoption of virtual learning among students. For instructors, the flexibility to tutor anytime and anywhere, along with the ability to update materials in real-time, enhances teaching effectiveness. E-learning platforms also allow instructors to tailor content to students' needs and guide them towards appropriate resources (Rahayu & Wirza, 2020). Suleri and Suleri, A. (2019) emphasised that modern education increasingly goes beyond teacher-centered, face-to-face interactions. With technological advancements and the integration of the internet, many institutions have shifted to E-learning environments. This stands in contrast to traditional, teacher-centered learning, where the instructor holds the knowledge and controls the learning environment, often limiting student engagement and the development of critical thinking skills.

However, the effectiveness of E-learning technologies hinges on the quality of its design and the content's adaptability to the virtual resources. It is crucial that both students and instructors have self-concept that e-learning technologies can fully benefit them. The self-concept entails the perception and understanding of structure, content, and benefits of e- learning technologies (Showers et al, 2016). Self-concept does not only empower individual to engage with and effectively use new technologies but also ensures that e-learning can reach its full potential in educational settings. Ultimately, self-concept and attitude forms the foundation for the effective use of e-learning technologies. If pre-service teachers do not have self-concept of these tools, they are unlikely to use them, let alone do so efficiently or correctly. Therefore, fostering awareness and digital

literacy among both students and instructors is critical to the successful integration of e-learning technologies in Colleges of Education (Yousef and Basem, 2020). Key technologies for e-learning classrooms include video conferencing (that enables interactive, face-to-face sessions using platforms like Zoom), breakout rooms (facilitates small group collaboration), messaging apps and email (enhance communication and document sharing), social media e.g., Facebook (builds learning communities and shares resources) and YouTube (provides access to educational videos and open resources). These categories technologies showcase the adaptability of e-learning in enhancing education while addressing diverse learner needs.

Shahzad et al. (2021) posited that in a study comparing e-learning experiences, female students reported a greater preference for structured and interactive learning environments, which facilitated better engagement and satisfaction. Female students were more likely to participate actively in smaller, intimate groups, whereas male students preferred more independent, less structured formats (Chung et al., 2020). One of the most significant challenges highlighted in gender-specific studies is the impact of domestic responsibilities on female students' ability to engage effectively with online learning. Female students often face interruptions and distractions due to caregiving roles and other home-based duties, which may negatively affect their learning outcomes (Murphy, 2020). This issue was particularly pronounced during the pandemic, when many female students found it difficult to balance educational responsibilities with household obligations (Saadia et al., 2024). Furthermore, studies have indicated that the availability of technology and reliable internet access is more critical for female students, who are more likely to be affected by the lack of these technologies (Ali, 2020).

Almusharraf and Khahro (2020) viewed that the self-concept of e- learning's effectiveness differs significantly between male and female students. Studies suggest that female students tend to perceive e-learning as less conducive to practical and hands-on subjects, such as engineering, which often require physical interaction and laboratory work. Male students, on the other hand, have been reported to use more easily to technical aspects of e-learning platforms, possibly due to higher levels of self-efficacy in using digital tools (Wei & Chou, 2020). This disparity in self-concept can directly impact their knowledge, with female students potentially facing more obstacles towards ensuring a beneficial experience especially in technical disciplines (Kaufmann & Vallade, 2021).

The gender differences in online learning experiences suggest the need for more tailored approaches to course design and support systems. To enhance course completion rates among female students, particularly in male-dominated fields like engineering, institutions should consider incorporating more interactive and supportive elements into online courses. For instance, greater access to faculty through virtual office hours, personalized feedback, and peer support networks can help mitigate some of the challenges faced by female students (Murphy, 2020). Additionally, addressing the technological disparities that disproportionately affect

female learners, such as by providing access to necessary hardware and stable internet connections, is critical to ensuring equitable outcomes (Shahzad et al., 2021).

Wei and Chou (2020) reported that gender differences also manifest in the level of satisfaction and perceived performance in online learning. The male students have higher levels of satisfaction with the flexibility and autonomy provided by online courses, which contributed positively to their performance. Conversely, female students expressed concerns about the lack of face-to-face interaction, which they believed hindered their ability to perform as effectively (Xiaoping & Leimin, 2023). These concerns were further echoed in research indicating that female students often feel isolated in online learning environments, leading to feelings of loneliness and disengagement, which can adversely affect their academic outcomes (Kaufmann & Vallade, 2021).

Statement of the problem

E-Learning is the use of technology to enable people learn at anytime and anywhere. E-learning is the use of computer, internet technologies and other multimedia tools in the delivery of a wide variety of services and processes, leading to the enhancement of knowledge, performance and productivity. Deshmukh et al (2018) worked on the role of e-learning in science education vis-à-vis teacher training institutes in Middle East. The result revealed that participants had a better understanding of course materials through using the online medium. However, the researcher focused on the role of e-learning in science education and teacher training institutes in middle east but not focus on self-concept and use of e-learning technologies among science education students in colleges of education in Kwara State, Nigeria.

It has been observed that the teacher take the charge in the traditional method of teaching in Kwara State and some topics in science education are difficult to be taught in the class for example mixing chemical. Katcha et al (2018) asserted that he traditional approach to teaching which has been in use for centuries involves the transfer of information from the teacher who is more or less like a sage to students who are mere receptacles. These students who have become passive listeners are not actively involved in the teaching and learning process therefore interest in the lesson most times is lost. This gap motivated the present investigation the self-concept and use of e-learning technologies among science education students in colleges of education in kwara state, nigeria.

Purpose of the study

The main purpose of this study was to self-concept and use of e-learning technologies among science education students in colleges of education in Kwara State, Nigeria. Specifically, the study examined:

1. the level of Science Education students' self-concept on e-learning technology.

2. the level of use of e-learning technologies among Science Education students.
3. influence of gender on Science Education students' self-concept on e-learning technologies
4. influence of gender on Science Education students on the use of e-learning technologies.

Research Questions

The following research questions were answered in this study.

1. What is the level of self-concept regarding e-learning technology among science education students?
2. What is the level of use of e-learning technologies among science education students
3. What is the difference in self-concept between male and female science education students?
4. What is the difference in e-learning technology use between male and female science education students?

Research Hypotheses

The following null hypotheses were tested in the study

Ho_1: There is no significant difference in Science Education students' self-concept toward e-learning technologies based on gender.

Ho_2: There is no significant difference in Science Education students' use of e-learning technologies based on gender.

Methodology

The design adopted for this study was the descriptive survey research design. This is considered appropriate because a self-administered questionnaire was used. The population for this study consisted all 415 Science Education students who are in 200-level in four government-owned colleges of education in Kwara State, which are made up of Biology, Chemistry, Computer Science, Integrated Science, Mathematics, Physical/Health Education and Physics. The sample for this study comprised 184 Science Education students who are in 200-level 2025/2026 academic session from two federal and state colleges of education in Kwara state. "Nigerian Army College of Education, Ilorin (NACOE) and Kwara State College of Education, Ilorin" using stratified random sampling technique. The choice of using 200-level was that 100-level were new students while 300-level were on teaching practice.

The instrument used for data collection was researcher-designed questionnaire titled: Self-concept and use of e-learning technologies among colleges of education Science students in Kwara state". The instrument was divided into three sections (A, B, & C). Section A dealt with general information for the respondent on gender. Section B in on self-concept of Science Education students and Section C is on the use of e-learning technologies. Four point likert scale of strongly Agree (SA), Agree (A), Disagree (D) and Strongly Disagree

(SD) and scored 4, 3, 2, and 1 respectively. Three Educational Technologies experts validated the instruments from Emmanuel Alayande University of Education, Oyo, Oyo State. The validated instrument was used to carry out the reliability test. The instrument was administered to 20 Science Education students, 200 level in Federal College of Education (Special), Oyo, Oyo State. The data obtained was analysed to check for internal consistency in reliability and the Cronbach Alpha statistics yielded self-concept scale $\alpha = 0.82$ and use of e-learning scale $\alpha = 0.75$. The researcher sought permission from the Dean school of Science Education through the Head of department to administer the questionnaires to Science students. The students were encouraged to fill the questionnaire on the spot. Thereafter, the researcher collected the questionnaire immediately after response. The research question one, two, three and four were answered using Mean and Standard Deviation while t-test statistics was used to test hypotheses one and two at 0.05 level of significant.

Results

Research Question One: What is the influence of Science Education students' self-concept on e-learning technology?

Table 1: The Mean and Standard Deviation on the level of Science Education students' self-concept on e-learning technology

S/No	Statement	Mean	Std. Deviation
1.	E-learning technologies give current and error-free information	3.09	1.015
2	Students are scared of E-learning technologies	2.09	1.023
3	The E-learning contains assignment that develop the critical ability	3.12	.945
4	E-learning facilitates learning by doing	3.34	.787
5	The E-learning allows learners to work on their own pace	3.34	.744
6	E-learning encourages discussion and collaboration among learners	2.97	1.024
7	Screens are designed in a clear and understandable manner	2.84	.978
8	There are E-learning instructions for the installation	3.08	.963
9	E-learning provides immediate feedback after responses	1.98	.983
10	E-learning allows students to print out their feedback	2.16	1.107
	Grand mean	**2.80**	

Criterion Mean=2.50

Table 1, item 4 indicates that e-learning facilitates learning by doing had the highest mean score of 3.34 with standard deviation value of .784. This was followed by item 5, the e-learning allows learners to work on their own pace had the mean score of 3.34 with standard deviation value of .744, while item 9, the e-learning

provides feedback immediately after response had the lowest mean score of 1.98 with standard deviation value .983. Conclusively, the grand mean score on the influence of Science Education students' self-concept of e-learning technology was 2.80. Therefore, by using 2.50 as the benchmark, it could be inferred that Science Education students' self concept of e-learning is high.

Research Question two: What is the influence of Science Education students on the use of e-learning technologies?

Table 2: The Mean and Standard Deviation on the level of use of e-learning technologies among Science Education students

S/No	Statement	Mean	Std. Deviation
1.	The use of e-learning technologies makes my study very interesting.	3.15	.902
2	The use of e-learning technologies makes learning comfortable	3.03	1.040
3	The use of e-learning technologies for assignment is better than the use of paper (hard copy)	3.03	.940
4	The use of e-learning technologies for learning consumes more time than lectures from the lecturers	1.89	.911
5	The use of e-learning technologies for learning is easy	3.24	.823
6	The use of e-learning technologies for learning requires the assistance of experts and special skills	1.85	1.007
7	I am ready to use e-learning technology for learning instead of lecturer notes	3.18	.898
8	The use of e-learning technology for learning makes me lazy and unserious	1.77	.839
9	E-learning technologies are better used for communication and social interaction	3.14	.924
10	The use of e-learning technologies for learning makes students to perform poorly in their academic works	2.11	.963
	Grand mean	2.64	

Criterion mean= 2.50

Table 2, item 5 indicates that the use of e-learning technologies for learning is easy had the highest mean score of 3.24 with standard deviation value of .823. This is was followed by item 7, I am ready to use e-learning technologies for learning instead of lecture notes had the mean score of 3.18 with standard deviation value of 1.8 98, while the use of e-learning technologies for learning make me to be lazy and unserious had the lowest

mean score of 1.77 with standard deviation value of .839. On the final analysis, the grand mean on the influence of science education students' on the use of e-learning technology was 2.64. Therefore, by using 2.50 as the benchmark, it could be inferred that science education students' use of e-learning was positive.

Research Question Three: What is the influence of Science Education students' gender self-concept on e-learning technologies?

Table 3: The Mean and Standard Deviation on influence of gender of Science Education students' self-concept on e-learning technology

Gender	N	Mean	Std. Deviation
Male	76	27.71	3.106
Female	108	28.22	3.561

Table 3 shows that the male science education students had the mean score of 27.71 with standard deviation value of 3.106 while the female science education students had the mean score of 28.22 with standard deviation value of 3.561. this result reveals a difference in the value of male scores. Therefore, it can be said that there is a difference between male and female science education students' self-concept toward e-learning technology.

Research Question Four: What is the influence of Science Education students' gender on the use of e-learning technologies?

Table 4: The Mean and Standard Deviation on influence of gender of Science Education students' use on e-learning technology

Gender	N	Mean	Std. Deviation
Male	76	26.25	2.659
Female	108	26.50	2.290

Table 4 shows that the male science education students had the mean score of 26.25 with standard deviation value of 2.659 while the female science education students had the mean score of 26.50 with standard deviation value of 2.290. The result reveals a difference in value of male scores. Therefore, it can be concluded that there is a difference between male and female Science Education students on the use of e-learning technology.

Hypotheses Testing

Hypothesis one: There is no significant difference in Science Education students' self-concept toward e-learning technologies based on gender.

Table 5: Summary of t-test of Science Education students' self concept on e-learning technologies

Gender	N	Mean	Std.D	df	T	Sig(p)	Remark
Male	76	27.7105	3.10619	182	1.011	.313	NS
Female	108	28.2222	3.56078				

Table 5 shows that there was no significant difference between the male and female science education students' self -concept toward e-learning technologies (df=182;t=1.011,p>.313). Based on this result, hypothesis 1 is not rejected.

Hypothesis two: There is no significant difference in Science Education students' use of e-learning technologies based on gender.

Table 6: Summary of t-test of Science Education students' use of e-learning technologies

Gender	N	Mean	Std.D	Df	T	Sig(p)	Remark
Male	76	26.2500	2.65895	182	.682	.496	NS
Female	108	26.5000	2.28976				

Table 6 shows that there was no significant difference between the male and female science education students' use of e-learning technologies (df=182; t=.682, p>.496). Based on this result, hypothesis 2 is not rejected.

Discussion of Findings

The research findings of this study are discussed in relating to the research questions and research hypotheses. The findings of this study revealed that Science Education students' self concept of e-learning is high. The finding of this study agreed with that of Showers et al (2016) who noted it is crucial that both students and instructors have self-concept that e-learning technologies can fully benefit them. The self-concept entails the belief and understanding the structure, content, and benefits of e- learning technologies. The findings of this study showed that science education students' on the use of e-learning was positive. The findings of this study was in agreement with Pelet and Lecarte (2018) who maintained that e-learning or virtual learning is a teaching and learning environment or a shared online learning space that facilitates meaningful interaction, communication, view and engagement with learning resources between students and materials, students and lecturers or teachers and students that promotes exchange of meaningful ideas together at the same time all in an online setting. In this setting, both students and teachers participate virtually. This interaction occurs through digitally delivered content, network-based services, and tutoring support, often utilizing various online tools and media, such as the internet, intranets, extranets, simulations, games, virtual worlds, cloud services, satellite broadcasts, and web platforms.

This finding revealed that there was no significant difference between the male and female science education students' self-concept toward e-learning technologies. This finding contradicts the finding of Almusharraf and Khahro (2020) who viewed that the self-concept of e- learning's effectiveness differs significantly between male and female students. Studies suggest that female students tend to perceive e-

learning as less conducive to practical and hands-on subjects, such as engineering, which often require physical interaction and laboratory work. Male students, on the other hand, have been reported to use more easily to the technical aspects of e-learning platforms, possibly due to higher levels of self-efficacy in using digital tools (Wei & Chou, 2020). This disparity in self-concept can directly impact their knowledge, with female students potentially facing more obstacles in fully benefiting from online learning environments, especially in technical disciplines (Kaufmann & Vallade, 2021).

Th findings of the study also revealed that there was no significant difference between the male and female science education students' use of e-learning technologies. The result of this study also contradicts the findings of Wei and Chou (2020) who reported that gender differences also manifest in the level of satisfaction and perceived performance in online learning. The male students have higher levels of satisfaction with the flexibility and autonomy provided by online courses, which contributed positively to their performance. Conversely, female students expressed concerns about the lack of face-to-face interaction, which they believed hindered their ability to perform as effectively (Xiaoping Gao & Leimin Shi, 2023). These concerns were further echoed in research indicating that female students often feel isolated in online learning environments, leading to feelings of loneliness and disengagement, which can adversely affect their academic outcomes (Kaufmann & Vallade, 2021).

Conclusion

Based on the findings of the study, Science Education students' self concept of e-learning is high. Science Education students' on the use of e-learning was positive. There was no significant difference between the male and female science education students' self-concept toward e-learning technologies. Also, there was no significant difference between the male and female science education students' use of e-learning technologies.

Recommendations

Based on the findings of this study the following recommendations were made.

1. Science education students should be encouraged to make use of e-learning technologies for primarily for instructional purposes.
2. Lecturers in colleges of education should expose their students to e-learning based instructional strategies (e.g flipped classroom, blended learning etc) to promote students' autonomy to knowledge acquisition, discovery learning and student-centered instructional approach.
3. Nigeria certificate in Education (NCE) minimum standards curriculum should be reviewed and include a compulsory course on digital literacy and e-learning tools to incorporate and encourage self-concept of e-learning technology in colleges of education.

4. Government and curriculum developers should embrace student-centered learning approach in teaching and learning process by the provision of subsidized internet access, computer labs, and faculty training so that internet facilities will be available for student to use e-learning in instruction.

Suggestion for Further Studies

Based on the research findings, the following suggestions were made for further studies. This research work can be conducted in other states in Nigeria.

The sample of this study was taken from only government-owned colleges of education. A similar could be conducted in both government-owned and private-owned colleges of education.

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