SSR Journal of Artificial Intelligence (SSRJAI)

OPEN ACCESS

Homepage: https://ssrpublisher.com/ssrjai/

Volume 3, Issue 6, 2026 ISSN: 3049-0413

E-Learning Platforms' Characteristics and Computer Education Students' Academic Engagement in Federal Universities in South – South, Nigeria

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Received: *05.05.2026* | ***Accepted:*** *02.06.2026* | ***Published:*** *03.06.2026*

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DOI: *10.5281/zenodo.20530963*

Abstract **Original Research**

This study examined the extent to which e-learning platforms' characteristics influence the academic engagement of Computer Education students in Federal Universities in South–South Nigeria. Seven specific objectives, seven research questions, and seven hypotheses were formulated to guide the study. The study adopted a descriptive survey research design. The population comprised 1,100 (400-level) Computer Education students in selected Federal Universities in the South–South region of Nigeria. A sample size of 286 respondents was drawn using Taro Yamane's formula, while a simple random sampling technique was employed to select the participants. A 70-item instrument titled "E-learning Platforms' Characteristics Influence on Academic Engagement Questionnaire (EPCIAE-Q)" was developed by the researcher for data collection. The instrument was subjected to face validation by three experts: one expert from Educational Technology Department University of Uyo, Uyo Akwa Ibom State, one expert from Measurement and Evaluation Department, University of Uyo, Uyo Akwa Ibom State and another one expert from Computer and Robotic Education Department University of Uyo, Uyo Akwa Ibom State. To determine the characteristics of the instrument, the validated questionnaire was administered to 30 Computer Education students from Federal Universities in the South–South region who were not part of the study sample. Cronbach's Alpha statistics was used to establish the reliability coefficient of the instrument. The administration of the questionnaire was carried out by the researcher with the assistance of research assistants across the three Federal Universities in the region that offer Computer Education as a discipline. Linear regression analysis was used to answer the research questions and test the null hypotheses at the 0.05 level of significance.

Keywords: E-Learning Platform Characteristics, Academic Engagement, Influence, Computer Education.

Introduction

The rapid advancement of information and communication technologies has transformed educational systems worldwide, leading to the widespread adoption of e-learning systems in higher education. E-learning systems are web-based platforms used for the creation, delivery, management, and evaluation of educational content within virtual learning environments (Singh et al., 2024; Abubakar et al., 2024). These systems have become essential

tools for knowledge dissemination, academic interaction, and collaborative learning. Through internet-based technologies, students can access instructional materials, participate in discussions, complete assignments, and communicate with lecturers and peers beyond the physical boundaries of traditional classrooms. Consequently, e-learning systems now play a central role in modern academic infrastructure.

The significance of e-learning became more evident during the COVID-19 pandemic, when institutions worldwide rapidly shifted from face-to-face instruction to online learning in order to maintain educational continuity (Okoye et al., 2023; Falola et al., 2022). This experience highlighted the importance of digital infrastructure in higher education and encouraged universities to invest more heavily in digital learning technologies. As a result, flexible learning models such as blended, hybrid, and fully online education have become increasingly common (Clark et al., 2025; Xianggang, 2023). These approaches allow students to access educational resources anytime and from any location, thereby promoting flexibility and inclusiveness in learning.

The effectiveness of e-learning systems depends largely on several important technological and pedagogical characteristics, including accessibility, usability, interactivity, flexibility, collaborative tools, multimedia integration, assessment capabilities, and feedback mechanisms. Usability refers to the ease with which students can navigate digital platforms and complete academic tasks without technical difficulties. Effective e-learning systems are characterized by intuitive interfaces and user-friendly navigation, while poor interface design and inadequate technical support reduce students' willingness to participate in online learning (Ilavbare & Ewere, 2025; Singh et al., 2024).

Accessibility is another important feature of e-learning systems. It ensures that students can access instructional materials anytime and anywhere, thereby providing equal learning opportunities regardless of socioeconomic background (Abugu et al., 2024). Interactivity also plays a major role in effective online learning. Features such as discussion forums, video conferencing, instant messaging, and collaborative activities encourage communication and active participation among students and lecturers. These interactive experiences improve motivation, critical thinking, and overall student engagement (Banat et al., 2024).

Flexibility is equally significant because it allows students to learn at their own pace and according to their personal schedules. This is especially beneficial for students who combine academic responsibilities with employment or family obligations (Clark et al., 2025). Collaborative tools such as shared documents, virtual meeting rooms, and project management systems further enhance learning by encouraging teamwork, peer interaction, and collaborative problem-solving skills (Zabukovšek et al., 2023).

The integration of multimedia resources, including videos, animations, simulations, and audio recordings, also contributes significantly to effective e-learning. Multimedia improves students' understanding of complex concepts and enhances information retention compared to conventional text-based instruction (Singh et al., 2024). In addition, digital assessment tools such as online quizzes, assignments, and examinations enable lecturers to monitor student progress efficiently and provide timely feedback. Electronic feedback increases students' awareness of their academic performance and improves motivation, satisfaction, and engagement with online learning (Ríos-Muñoz et al., 2025; Banat et al., 2024).

Academic engagement, defined as students' active involvement and commitment to learning activities, is strongly associated with the effectiveness of e-learning systems. It includes behavioural, emotional, and cognitive dimensions (Fredricks et al., 2004; Bond et al., 2022). Behavioural engagement involves participation in academic tasks, emotional engagement refers to students' interest and enthusiasm for learning, while cognitive engagement reflects the level of critical thinking and intellectual effort applied to learning activities.

In Africa, the implementation of e-

learning technologies continues to grow as institutions seek to improve access to education and instructional quality. However, challenges such as inadequate ICT infrastructure, poor internet access, and limited technological skills among students and lecturers continue to hinder effective implementation (Aneke & Ibiam, 2023). Similar problems exist in Nigerian universities despite increasing adoption of digital learning technologies. Research indicates that while e-learning tools improve student engagement, issues such as unstable internet connectivity, insufficient institutional support, and low digital competence reduce their effectiveness (Ilavbare & Ewere, 2025; Abugu et al., 2024).

Federal universities in the South-South region of Nigeria, including the University of Benin, University of Port Harcourt, University of Calabar, and University of Uyo, have implemented digital learning systems to support teaching and learning activities. Computer education students, in particular, depend heavily on these systems because their academic training requires the use of programming tools, virtual laboratories, and collaborative software development platforms. Despite the growing importance of e-learning in these institutions, there is still limited understanding of how specific characteristics of e-learning systems influence student engagement. Most previous studies focused mainly on general student populations or institutional adoption of technology rather than examining the effects of specific e-learning attributes on academic engagement. Therefore, further research is necessary to understand how features such as accessibility, usability, interactivity, flexibility, multimedia integration, and feedback mechanisms affect student engagement and learning outcomes in higher education.

Statement of the problem

The rapid development of information and communication technologies has resulted in extensive use of e-learning throughout the world. In addition to traditional instructional settings, these technologies provide access to educational resources, engagement of faculty and students, interaction with peers and participation in academic activities (Abugu et al., 2024). As a result, instructional effectiveness and levels of student involvement are increasingly achieved by colleges through increased reliance on e-learning technologies. Use of numerous e-learning technologies has greatly improved processes of teaching and learning at federal universities in the southern geopolitical zone of Nigeria (Eze et al., 2023). This effort was especially accelerated in response to the COVID-19 pandemic, for which implementation of systems of distance education enabled maintenance of continuity of academic operations (Olusanya, 2022). These systems are expected ultimately to increase opportunities for collaboration and to further enhance levels of student participation in instructional activities and overall academic engagement.

However, major concerns remain with regard to low levels of academic engagement achieved in settings of online learning by many students at Nigerian colleges. For example, some students routinely delayed submission of assignments, participated minimally in online discussions and had very limited interactions with instructional resources (Nwafor and Adeyemi, 2025). These patterns of behavior reflect major concerns concerning the ability of present systems of e-learning to support substantial experiences of learning.

Characteristics of the e-learning systems themselves may represent an important component of this problem. All aspects of system accessibility, usability, interactivity, flexibility, availability of collaborative tools, integration of multimedia components, capacity for assessment and mechanisms for provision of feedback should ultimately influence patterns of student interaction with systems of distance education (Abugu et al., 2024; Eze et al., 2023). When these features of the instructional environment are inadequately developed or implemented, major impediments to active participation of students in processes of learning should result.

Studies of the use of e-learning technologies in higher education have been reported extensively by many investigators. However, descriptions of overall patterns of use, institutional capacity for implementation and perceptions of the quality of instructional

experiences in settings of online learning have dominated the results of most studies. Scant empirical attention has been devoted to understanding how various attributes of e-learning systems influence student academic engagement, especially for computer education students who rely heavily on digital technology for instruction (Olusanya, 2022; Nwafor and Adeyemi, 2025). In addition, we report on our limited examination of this association for federal universities located in the South-South geopolitical region of Nigeria, where differences in infrastructure for information and communication technology and for methods of digital instruction may affect the effectiveness of e-learning systems (Eze et al., 2023).

Finally, it is precisely the uncertain effects of e-learning system attributes on academic engagement of computer education students at federal universities in the South-South region of Nigeria that represent the major focus of the present work. As a consequence, our objectives were to evaluate the effects of specific attributes of e-learning systems on academic participation of students at these institutions.

Purpose of the study

The academic engagement of students receiving computer education at federal universities in the South-South geopolitical zone of Nigeria was the focus of the present study designed to evaluate the effects of characteristics of e-learning systems on student engagement. To this end, we addressed the following objectives:

i. We evaluated the extent to which accessibility of e-learning systems influenced academic engagement of students receiving computer education.

ii. We determined the effects of usability of e-learning systems on academic engagement of students receiving computer education.

Research Questions

This study was guided by the following research questions developed for the purpose of this work.

i. To what extent does interactivity with e-learning systems influence academic engagement of students in computer education?

ii. What effects do mechanisms for assessment on e-learning systems have on academic engagement of students in computer education??

Research Hypotheses

The subsequent hypotheses were established to direct the study:

HO1: No significant effects on the academic engagement of students receiving computer education were obtained with the interactivity of e-learning systems.

HO2: The accessibility of e-learning systems had no major effect on academic engagement of students receiving computer education.

Research Methods

This study adopted a descriptive survey research design. Descriptive research is used to systematically describe a population, condition, or phenomenon and answer questions relating to what, where, when, and how rather than why (McCombes, 2023). The design is non-experimental because variables are not manipulated but are observed and measured as they naturally occur. The survey design was considered appropriate because it enabled the researcher to obtain information on the effects of e-learning platform characteristics on students' academic engagement based on the perceptions and experiences of the respondents. The study was conducted in selected Federal Universities in the South-South geopolitical zone of Nigeria. The South-South region comprises six states and serves as a major economic hub due to its rich natural resources and strategic location along the Atlantic coast. Three Federal Universities located in Edo, Akwa Ibom, and Cross River States were selected for the study because they offer computer education programmes and actively utilize e-learning systems to support teaching and learning activities. The population of the study consisted of 1,100 students enrolled

in computer education programmes in Federal Universities within the South-South region during the 2024/2025 academic session. These students regularly interacted with digital learning technologies in the course of their studies. A sample size of 286 students was determined using the Taro Yamane formula, which is commonly applied in social science research. A multistage sampling procedure was employed for the study. Purposive sampling was first used to select Federal Universities offering computer education programmes. Thereafter, proportional sampling was used to determine the number of respondents selected from each institution, while simple random sampling was used to select participants from the departments involved. This ensured that all students had equal chances of being selected for the study. Data for the study were collected using a structured questionnaire developed by the researcher titled "E-learning Platform Characteristics and Academic Engagement Questionnaire (EPCIAE-Q)." The instrument consisted of two sections. Section A collected demographic information such as gender, institution, and level of study, while Section B contained items relating to the study variables, particularly accessibility and usability of e-learning platforms. The questionnaire items were structured on a five-point Likert scale. The instrument was validated by three experts from the departments of Educational Technology, Measurement and Evaluation, and Computer and Robotics Education at the University of Uyo. Their observations and recommendations were incorporated into the final draft of the instrument to ensure its relevance and adequacy in measuring the variables under study. To establish reliability, the validated questionnaire was administered to 30 computer education students from Federal Universities outside the study sample. Cronbach's Alpha was used to determine internal consistency, and a reliability coefficient of 0.95 was obtained, indicating that the instrument was highly reliable. Approval to administer the questionnaire was obtained from the Heads of Departments of the selected universities. With the assistance of research aides, copies of the questionnaire were distributed to respondents in the selected institutions. Out of the 286 questionnaires distributed, 260 were properly completed and returned, representing a response rate of 91% and an attrition rate of 9%. Data collected were analyzed using simple linear regression to test the hypotheses at the 0.05 level of significance. The coefficient of determination (R^2) was used to determine the extent to which e-learning platform characteristics influenced students' academic engagement. According to Schroeder, Sjoquist, and Stephan (2018), effect sizes were interpreted as low (0.01–0.39), moderate (0.40–0.59), high (0.60–0.79), and very high (0.80–1.00). Results were considered statistically significant when p-values were less than 0.05. Ethical considerations were strictly observed throughout the study. Informed consent was obtained from all participants before data collection. Participants' confidentiality and privacy were protected, and no personal identifiers or institutional names were linked to the reported data. In addition, all sources consulted in the study were properly acknowledged to avoid plagiarism.

Results and Discussion

Research Question 1

To what extent does accessibility of e-learning platform influence academic engagement of Computer Education students in Federal universities in South-South, Nigeria?

Table 4.1: Summary of the extent of influence of accessibility of e-learning platform on academic of Computer Education students.

(n =260)

Source of Variation	R	R Square (R^2)	Remark
Accessibility of E-learning platforms Academic Engagement	.91	.82	Very High Extent (VHE)

Source: Fieldwork (2026)

In table 4.1, the report on the extent to which accessibility to e-learning platforms influences student engagement with federal universities in southern Nigeria. The strong positive association between accessibility to e-learning platforms and student engagement was reflected by a correlation coefficient (R) of 0.91. Accessibility to e-learning platforms accounted for 82% of the variance in student engagement with federal universities, and explained 82% of the total variance in student engagement. These results confirm the importance of increasing access to e-learning platforms for enhancing student engagement in education offered by federal institutions in southern Nigeria.

Research Question 2

What is the extent of influence of e-learning platforms usability on academic engagement of Computer Education students in Federal universities in South-South, Nigeria?

Table 4.2: Summary of the extent of influence of usability of e-learning platforms on academic engagement Computer Education students.

(n=260)

Source of Variation	R	R - Square (R^2)	Remark
usability of e-learning platforms Academic Engagement	.83	.69	High Extent (HE)

Source: Fieldwork (2026)

Table 4.2 summarizes the extent to which the usability of e-learning systems influences academic engagement of students majoring in computer education at federal universities in southern Nigeria. The large correlation coefficient of 0.83 confirms a strong positive relationship between the usability of e-learning systems and student academic engagement. The resulting coefficient of determination (R2 = 0.69) reflects the proportion of variance in student academic engagement attributable to the usability of e-learning systems. Thus, 69% of the variability in student academic engagement was attributable to variations in the usability of e-learning systems. Finally, our results confirm that usability of e-learning systems has a major

effect on academic engagement of students majoring in computer education.

Research Hypothesis One

H_{01}: $Ho_{1:}$ Accessibility of e-learning platforms has no significant influence on academic engagement of computer education students**.**

Table 4.8: Regression analysis of e-learning platform accessibility influence on academic engagement of Computer Education students in Federal Universities in South–South, Nigeria.

Source of Variation	Sum of Squares	df	Mean Square	F	p-value	Decision
Regression	438.07	1	438.07	1206.60	.00	Reject Ho
Residual	93.67	258	.36			
Total	531.74	259				

Source: Field Data (2026)

The accessibility of e-learning systems has a major impact on academic participation by students majoring in computer education at federal universities in southern Nigeria. This is demonstrated by our regression analysis summarized in Table 4.8 and reflecting the effects of e-learning system accessibility on student academic participation at federal institutions in southern Nigeria. Our results confirm rejection of the null hypothesis with a p value less than 0.05. The magnitude of effects was reflected by an F value of 1206.60 and an associated p value of 0.00 for 1 and 258 degrees of freedom, respectively.

Research Hypothesis Two

$Ho_{2:}$ Usability of e-learning platforms has no significant influence on academic engagement of computer education students**.**

Table 4.9: Regression Analysis of usability of e-learning platforms on Computer Education students' academic engagement in Federal Universities in South – South, Nigeria.

Source Variation	Sum of Squares	df	Mean Square	F-value	p-value	Remark
Regression	368.30	1	368.30	581.43	.00	Reject Ho
Residual	163.43	258	.63			
Total	531.74	259				

Source: Field Data (2026)

The academic engagement of students majoring in computer education at federal universities in south-south Nigeria was strongly influenced by the usability of e-learning systems, as indicated

by results of the regression analysis shown in Table 4.9. Our calculated F value of 581.43 was significant at 1 and 258 degrees of freedom. This yielded a level of statistical significance of p = .00, which is less than the conventional limit of 0.05 for statistical significance. As a consequence, we rejected the null hypothesis and confirmed that usability of e-learning systems profoundly influenced academic involvement of students at federal universities in south-south Nigeria.

Discussion of Findings

Accessibility of e-learning systems substantially influenced student engagement with academic tasks. Especially in developing settings with frequent barriers to infrastructure and digital access, these results confirm the importance of accessibility as a prerequisite for successful implementation of e-learning and for increased academic engagement. Availability of facile login procedures, compatibility with various devices, continuous access to the Internet and intuitive operation of e-learning systems increased student willingness to engage with course content and participate in academic activities, and in turn contributed substantially to variability in patterns of student engagement. As a result, accessibility further supported development of active participation, interaction and long-term learning in digital settings. These results support and extend those previously reported for accessible online courses and instructional materials, which resulted in substantial increases in teaching efficacy and student engagement in college settings (Lowenthal and Lomellini, 2023). In general, our results confirm again the importance of accessibility for effective implementation of e-learning and for increased student engagement.

Platform usability for e-learning systems represents a major influence on student engagement for computer education courses. Simple system requirements for understanding and submitting coursework lead to reliable measures of system performance. Users readily acquire knowledge about new system capabilities and experience infrequent difficulties with technology-based instructional activities. These results support the conclusions of Al-Fraihat's (2020) empirical study that system quality strongly influences perceptions of system usefulness, user satisfaction and overall net benefits for e-learning.

Technical robustness thus constitutes a major component of successful implementation of e-learning, especially in situations where limitations of infrastructure impair opportunities for technology-based learning. Overall, our results confirm the importance of platform usability for maintaining student engagement and achieving effective outcomes for e-learning in higher education.

Conclusion

Overall, these characteristics of e-learning systems were critical for determining academic engagement of students enrolled in computer education programs at federal universities in southern Nigeria. Methods of assessment were related to student engagement, but exerted relatively weak effects, thereby supporting the view that effectiveness of these methods depends on modes of implementation and availability of institutional support. As a result, these attributes influenced student engagement to a very substantial degree and provided support for rejection of the null hypothesis attributable to the large effects observed for all factors. Consequently, development and implementation of reliable, user-friendly, accessible, secure and continuously available systems for e-learning are of major importance to universities and to policymakers and should contribute substantially to increases in student engagement and to achievement of optimal outcomes for technology-mediated instruction.

Recommendations

Based on the outcome of this study, the following recommendations have been made:

1. The government and educational stakeholders share responsibility for strengthening implementation of e-learning policy with adequate funding, capacity-building efforts, mechanisms for monitoring and assuring quality, and

to maximize institutional efforts and achieve high levels of platform availability and effectiveness.

2. Strong protocols for online communication and well-defined expectations for interactivity are required to develop student confidence and encourage continued participation in online learning. In addition, e-learning platforms should be continuously developed and refined using user-centered methods and with provision of planned training for faculty and students to optimize experience with the platform.

3. Investment in reliable systems for information technology and infrastructure support is also essential, because improvements in tools for collaborative learning and integration of multimedia depend on routine maintenance of systems, dependable operation of servers and rapid resolution of technical problems. This represents a commitment to long-term institutional development, not to a single event.

4. Finally, access to e-learning platforms should receive high priority from university administrators, especially with regard to compatibility with mobile devices, operation at low levels of information technology infrastructure and provision of equal access to students with widely varying resources and conditions for use of information technology. Only with integration of effective policies, institutional investment in infrastructure and technology, high standards of usability for the platform and complete accessibility will full potential for e-learning be achieved.

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