



Perceived Influence of E-Learning Platform Interactivity on Academic Engagement of Computer Education Students in Federal Universities in South-South, Nigeria

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Abstract

Original Research Article

This study examined the extent of the perceived influence of e-learning platform interactivity on the academic engagement of Computer Education students in Federal Universities in South-South, Nigeria. Two specific objectives, two research questions, and two 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 interactivity 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: Perceived E-Learning Platform Characteristics, Academic Engagement, Influence, computer Education.

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Introduction

The rapid advancement of Information and Communication Technology (ICT) has transformed higher education by expanding teaching and learning beyond traditional classrooms. Universities worldwide have

increasingly adopted e-learning platforms, including Learning Management Systems (LMS), Virtual Learning Environments (VLEs), and other digital communication tools, to facilitate knowledge delivery, collaboration, and academic interaction (Singh *et al.*, 2024; Abubakar *et al.*, 2024). These technologies



support flexible learning models such as blended, hybrid, and fully online education, enabling students to access learning resources regardless of time and location (Clark *et al.*, 2025; Xianggang, 2023). The COVID-19 pandemic further accelerated the adoption of e-learning, demonstrating its importance in ensuring educational continuity and prompting universities to invest more heavily in digital learning infrastructure (Okoye *et al.*, 2023; Falola *et al.*, 2022). The effectiveness of e-learning largely depends on the characteristics of the platforms used. According to Khan (2006), important platform characteristics include collaboration tools and multimedia integration.

E-learning platform interactivity refers to the extent to which digital learning environments enable meaningful interaction among students, instructors, learning content and technological tools. It encompasses features such as discussion forums, live chats, collaborative activities, quizzes, multimedia resources, feedback mechanisms and virtual communication. Effective interactivity promotes active participation and creates opportunities for learners to communicate, collaborate, and construct knowledge. Studies have shown that highly interactive online courses are associated with more favourable student engagement and learning experiences (Tsai *et al.*, 2021). Similarly, interactive technologies and collaborative activities can significantly enhance learner engagement, particularly in computer-related education (Ullah and Anwar, 2020).

Collaboration tools constitute another key characteristic of modern e-learning platforms. These tools enable learners to work together on academic tasks and share knowledge within virtual learning environments. Examples include group discussion forums, shared digital documents, virtual breakout rooms, and collaborative project management tools. Collaborative learning environments encourage teamwork, peer interaction, and collective problem-solving, which are essential components of meaningful learning experiences (Zabukovšek *et al.*, 2023).

Multimedia integration is also an important feature of e-learning platforms. Multimedia integration refers to the use of various digital

media formats such as videos, animations, simulations, and audio recordings to present learning materials. The use of multimedia content enhances students' comprehension of complex concepts by engaging multiple sensory channels during learning processes. Studies indicate that multimedia-based learning environments can improve students' motivation and knowledge retention compared to traditional text-based instructional methods (Singh *et al.*, 2024).

The effectiveness of these platform characteristics is reflected in students' academic engagement, which is widely recognized as a major determinant of academic success and learning outcomes. Fredricks, Blumenfeld, and Paris (2004) conceptualized academic engagement as comprising behavioural, emotional, and cognitive dimensions. Behavioural engagement refers to students' active participation in learning activities such as attending classes, completing assignments, and contributing to discussions. Emotional engagement reflects students' interest, enthusiasm, and sense of belonging, while cognitive engagement involves the mental effort and critical thinking invested in learning tasks. More recent studies have expanded this framework to include social and agentic engagement, emphasizing students' collaboration with peers and their active role in directing their own learning experiences (EiHES Validation, 2024).

In online learning environments, academic engagement becomes even more critical because students are expected to manage their learning independently. E-learning platforms provide discussion forums, collaborative projects, multimedia resources, and real-time communication tools that encourage active participation and deeper learning (Bond *et al.*, 2020; Xianggang, 2023). Contemporary research indicates that academic engagement is not merely classroom participation but a multidimensional construct encompassing behavioural, cognitive, emotional, social, and agentic involvement. Bell (2025) argues that traditional measures such as physical attendance no longer adequately represent engagement because students increasingly participate actively through digital learning platforms.

Similarly, Ozek and Fer (2026) emphasize that cognitive engagement reflects learners' ability to apply critical thinking, self-regulation, and problem-solving skills, while social and agentic engagement demonstrate students' collaboration with peers and their proactive involvement in shaping their learning experiences.

Academic engagement has been consistently associated with student satisfaction, which represents students' overall evaluation of their learning experiences and the extent to which their educational expectations are fulfilled. Students who actively participate in online discussions, collaborate with peers, complete learning tasks, and receive timely instructor feedback generally report higher satisfaction with their educational experiences. Effective communication, accessible learning resources, interactive instructional methods, and supportive learning environments all contribute significantly to both engagement and satisfaction (Banat *et al.*, 2024). Datu and King (2024) further established a reciprocal relationship between academic engagement and psychological well-being, demonstrating that engaged students tend to experience better mental health, while positive psychological well-being enhances sustained academic participation.

Moreso, despite the increasing adoption of e-learning technologies, higher education institutions in many African countries continue to face challenges that limit effective student engagement. These include inadequate ICT infrastructure, poor internet connectivity, limited digital literacy, and insufficient institutional support (Aneke and Ibiam, 2023). Similar challenges exist in Nigerian Universities, where the expansion of e-learning during and after the COVID-19 pandemic has been constrained by unstable internet access, inadequate technological facilities, and limited technical support (Okoye *et al.*, 2023; Ilavbare and Ewere, 2025). These barriers often reduce students' participation in online learning activities and negatively affect their satisfaction with digital learning environments.

Furthermore, within the South-South geopolitical zone of Nigeria, several Federal Universities have adopted e-learning platforms

to improve teaching and learning. However, limited empirical evidence exists regarding how the characteristics of these platforms influence the academic engagement and satisfaction of Computer Education students. Since these students rely extensively on digital technologies for programming, software development, database management, and other practical computing activities, effective e-learning platforms are essential for supporting their academic development. Although previous studies have examined e-learning adoption in Nigerian Universities, few have specifically investigated how platform characteristics such as collaboration tools and multimedia integration influence students' academic engagement and satisfaction. Addressing this gap will provide valuable evidence for improving digital learning systems and enhancing student learning experiences in federal universities within the South-South region of Nigeria.

Rotar (2025) revealed that the use of discussion forums substantially increases student involvement and promotes meaningful interactions and collaborative generation of knowledge by students. Similarly, Busnawir *et al.* (2025) indicates that collaborative document systems and shared workspaces enhance teamwork, improve academic performance and promote active participation in online learning environments. Hidayati and Slamet, (2025) who confirm that the use of video-based instruction increases student levels of comprehension and engagement with integration of visual and auditory instructional components and the application of interactive forms of multimedia technology to provide simulations, quizzes and experiences of digital storytelling further enhances student participation in the process of learning. In the same vein Getenet and Tualalelei (2023) also confirm that the integration of interactive technologies into conditions of e-learning increases both behavioral and cognitive levels of student engagement and use of audio-based instructional materials provides additional opportunities for flexible conditions of education in which students have access to instructional content at times of their convenience.

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 behaviour 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 main purpose of this study is to examine the perceived influence of e-learning platform interactivity on academic engagement of Computer Education students in Federal Universities in South-South, Nigeria. Specifically, the study seeks to:

- i. investigate the extent of perceived influence of e-learning platform collaboration tools on academic engagement of computer education students.
- ii. determine the extent of perceived influence of e-learning platform multimedia integration on academic engagement of computer education students.

Research Questions

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

- i. What is the extent of perceived influence of collaboration tools of e-learning platforms on academic engagement of computer education students?
- ii. What is the extent of perceived influence of multimedia integration of e-learning platforms on academic engagement of computer education students?

Research Hypotheses

The subsequent hypotheses were established to direct the study:

HO1: Collaboration tools of e-learning platforms have no significant perceived influence on academic engagement of computer education students.

HO2: Multimedia integration of e-learning platforms has no significant perceived influence on the academic engagement of computer education students.

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 collaboration tools of e-learning platform influence academic engagement of Computer Education students in Federal Universities in South-South, Nigeria?

Table 1: Summary of extent of perceived influence of e-learning platform collaboration tools on academic engagement of Computer Education students in federal universities in South-South, Nigeria.

(n=260)

Source of Variation	R	R Square (R^2)	Remark
Collaboration tools Academic Engagement	.90 ^a	.80	Very High Extent (VHE)

Source: Fieldwork (2026)

Table 1 shows the summary of extent to which e-learning platform collaboration tools influence academic engagement of Computer Education students in federal universities in South-South, Nigeria. The correlation coefficient, R-value of 0.90 indicates a very strong positive relationship between the collaboration tools of e-learning platforms and students' academic engagement. The R^2 value of 0.80 which is the coefficient of determination shows the extent of influence of e-learning platform collaboration tools on academic engagement of Computer Education students. This reveals that 80% variance in students' academic engagement is attributed to e-

learning platforms' collaboration tools. This implies that e-learning platforms' collaboration tools influences academic engagement of Computer Education students to a very high extent.

Research Question 2

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

Table 2: Summary of the extent of perceived influence of multimedia integration of e-learning platforms on academic engagement of Computer Education students in Federal universities in South-South, Nigeria.

(n=260)

Source of Variation	R	R Square (R ²)	Remark
Multimedia integration of E-learning platforms	.79	.63	High Extent
Academic Engagement			

Source: Fieldwork (2026)

Table 2 presents the analysis of the extent to which multimedia integration of e-learning platforms influences students' academic engagement in federal universities in South-South Nigeria. The correlation coefficient R of 0.79 indicates positive a strong positive relationship between the multimedia integration of e-learning platforms and students' academic engagement. The R² value of 0.63 which is the coefficient of determination shows the extent of perceived influence of multimedia integration of e-learning platforms on academic engagement of Computer Education students. This indicates that 63% variance in students' academic engagement is attributed to multimedia integration of e-

learning platforms. This implies that multimedia integration of e-learning platforms highly influences academic engagement of Computer Education students in Federal Universities in South-South, Nigeria.

Research Hypothesis 1

H₀₁: Collaboration tools of e-learning platforms have no significant influence on academic engagement of computer education students.

H₀₅: E-learning platform multimedia integration do not significantly influence academic engagement of computer education students.

Table 3: Regression Analysis of perceived influence of e-learning platforms collaboration tools on academic engagement of Computer Education students in Federal Universities in South – South, Nigeria.

Source Variation	Sum of Squares	Df	Mean Square	F-value	p-value	Remark
Regression	427.38	1	427.38	1056.65	.00	Reject Ho
Residual	104.35	258	.404			
Total	531.74	259				

Source: Field Data (2026)

Table 3 presents the regression analysis of the perceived influence of e-learning platforms' collaboration tools on academic engagement of Computer Education students in federal universities in South-South, Nigeria. The result

yielded an F-value of 1056.65 with a corresponding p-value of .00 at 1 and 258 degrees of freedom, indicating that the regression model is statistically significant at 0.05 level. Since the p-value is less than the

significant level of 0.05, the null hypothesis was rejected. This implies that e-learning platforms' collaboration tools significantly influence academic engagement of Computer Education students in Federal universities in South-South, Nigeria.

Research Hypothesis 4

Ho₆: Multimedia integration in e-learning platforms has no significant influence on academic engagement of computer education students.

Table 4 Regression Analysis of perceived influence of e-learning platforms' multimedia integration on academic engagement of Computer Education students in Federal Universities in South – South, Nigeria.

Source Variation	Sum of Squares	Df	Mean Square	F-value	p-value	Remark
Regression	333.55	1	333.55	434.24	.00	Reject Ho
Residual	198.18	258	.77			
Total	531.74	259				

Source: Field Data (2026)

Table 4 shows the regression analysis of perceived influence of multimedia integration of e-learning platforms on academic engagement of computer Education students in Federal universities in South-South, Nigeria. The results revealed an F-value of 434.24 with a corresponding p-value of .00, indicating that the regression model is statistically significant at the 0.05 level. Since the p-value is less than the significant level of 0.05, the null hypothesis is rejected. This implies that multimedia integration of e-learning platforms significantly influences academic engagement of Computer Education students in Federal Universities in South-South, Nigeria.

Discussion of Findings

The findings of the study revealed that e-learning platforms' collaboration tools influence academic engagement of Computer Education students to a very high extent. Furthermore, the analysis of the hypothesis showed that e-learning platforms' collaboration tools significantly influence academic engagement of Computer Education students in Federal Universities in South-South, Nigeria. This result is in

consonance with the findings of Rotar (2025) who revealed that the use of discussion forums substantially increases student involvement and promotes meaningful interactions and collaborative generation of knowledge by students. Similarly, the result is in agreement with the findings of Busnawir et al. (2025) who indicated that collaborative document systems and shared workspaces enhance teamwork, improve academic performance and promote active participation in online learning environments.

The findings of the study revealed that multimedia integration of e-learning platforms' interactivity highly influences academic engagement of Computer Education students in Federal Universities in South-South, Nigeria. Furthermore, the analysis of the hypothesis multimedia integration of e-learning platforms interactivity significantly influences academic engagement of Computer Education students in Federal Universities in South-South, Nigeria. This result is in assertion with the findings of Hidayati and Slamet, (2025) who assert that the use of video-based instruction increases student levels of comprehension and engagement with integration of visual and auditory instructional

components and the application of interactive forms of multimedia technology to provide simulations, quizzes and experiences of digital storytelling further enhances student participation in the process of learning. In the same vein, this result is in line with the finding of Getenet and Tualaulelei (2023) who revealed that the integration of interactive technologies into conditions of e-learning increases both behavioral and cognitive levels of student engagement and use of audio-based instructional materials provides additional opportunities for flexible conditions of education in which students have access to instructional content at times of their convenience.

Conclusion

Based on the findings, the study concludes that e-learning platforms' interactivity, particularly collaboration tools and multimedia integration, play a significant role in enhancing the academic engagement of Computer Education students in Federal Universities in South-South, Nigeria. The very high influence of collaboration tools indicates that interactive features that facilitate communication, discussion, knowledge sharing and collaborative learning encourage students to participate actively in academic activities. Similarly, the high influence of multimedia integration demonstrates that the incorporation of videos, audio, graphics, animations and other multimedia resources into e-learning platforms enhances students' interest and participation in learning. Therefore, effective integration of collaboration tools and multimedia features into e-learning platforms can significantly promote and improve the academic engagement of Computer Education students in Federal Universities in South-South, Nigeria.

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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