

Impact Of E-Learning On Academic Performance Of Senior Secondary School Students In Computer Studies In Jos North local government Area, Plateau State

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ABSTRACT: This study investigates the impact of e-learning on academic performance of senior secondary school students in Computer Studies in Jos North Local Government Area, Plateau State, Nigeria. Four research questions were formulated to guide the study and four hypotheses were tested for the study. Employing a quasi-experimental design with pre-test and post-test control groups, 100 Senior Secondary School 2 (SSS2) students from two public secondary schools were studied, with one group receiving instruction through a combination of e-learning and Conventional methods, and the other taught using conventional classroom methods only. Data were collected using an Academic Achievement Test and an E-Learning Impact Assessment Questionnaire (IAQ), and analyzed using descriptive statistics and inferential tests at a 0.05 significance level. Findings revealed that students exposed to blended learning demonstrated significantly higher academic performance than those taught using Conventional methods alone indicating that e-learning integration positively influences academic performance, motivation, and engagement in Computer Studies. Key factors affecting e-learning effectiveness included access to technology, training, and teacher support, though limited home assistance posed challenges. The study underscores infrastructural barriers such as inconsistent power supply and poor internet connectivity that constrain e-learning's full potential. It recommends adopting blended learning approaches, continuous training for students and teachers, and infrastructural investment to optimize educational outcomes through e-learning. The research contributes valuable insights for educational policy and practice aimed at enhancing secondary school education with digital tools in Nigeria.

KEYNOTES: LEARNING, E- LEARNING, AND PERFORMANCE

I. INTRODUCTION

Learning is a multifaceted process through which individuals acquire new knowledge, skills, attitudes, or values that result in relatively permanent changes in behavior and understanding. This process is fundamental to education and personal development, as it enables learners to integrate new information with prior knowledge and apply it in diverse contexts. Learning involves various dimensions, including cognitive, emotional, and social aspects, contributing to an individual's overall growth and ability to function effectively in different environments. E-learning, or electronic learning, is a modern educational approach that uses digital technologies to deliver structured learning experiences remotely and flexibly. It is formally defined as a pedagogical process that provides access to diverse educational resources such as instructional content, interactions with educators and peers, and various learning activities independent of geographical and temporal restrictions. It is essentially a contemporary form of distance education where learning materials, communication, and activities are provided online, allowing flexibility in how, when, and where learning occurs (African Scientific Journal, 2025).

This mode of learning is especially significant for its capability to bridge distance barriers and provide flexible access to education, making it a vital tool in contemporary educational systems (African Scientific Journal, 2025). Effective e-learning incorporates synchronous and asynchronous methods, enabling learners to participate in real-time classes or study at their own pace. This flexibility benefits diverse learner populations, including working students and those preparing for critical examinations. The inclusion of multimedia elements, interactive assessments, and collaborative platforms enriches the learning process, fostering deeper understanding and skill acquisition (Growth Engineering, 2025). Historically, e-learning emerged as a form of distance education delivered via electronic media, including the internet and intranet platforms. Over time, it has evolved to encompass complex interactive environments where learners engage not only with static content but also with collaborative tools and adaptive learning systems designed to personalize their educational experience (Poelmans et al., 2018). This development underscores e-learning's transition from simple content delivery to a comprehensive educational ecosystem enhancing student engagement and learning outcomes.

E-learning fundamentally uses technology as its core to facilitate and deliver education. It harnesses digital platforms, devices and tools to provide educational content and training remotely, enabling learners to access learning materials anytime and anywhere. Through technology, e-learning transforms traditional instruction by offering flexible methods such as virtual classrooms, interactive modules, and self-paced courses. These innovations make education more accessible and personalized, allowing students to engage with their learning in ways that cater to individual learning styles and schedules (2025; TechTarget, 2024). Technology has enhanced learning and is the major tool used in e-learning, enhancing accessibility, engagement, and effectiveness of instructional methodologies. One of the most significant milestones of technology in education is the ability to make learning resources available to a wider audience. According to Pappano (2017), online learning platforms have democratized education by allowing students from diverse backgrounds and geographical locations to access high-quality resources and expert instructors. This growth in online learning is reflected in the dramatic rise of Massive Open Online Courses (MOOCs), which provide free courses from renowned institutions worldwide. Technologies that facilitate e-learning often include personalized learning features, which help in catering to the specific needs of each learner.

Sharma and Sahu (2019) found that personalized learning plans facilitated through e-learning platforms led to a notable increase in students' grades, as tailored programs addressed individual strengths and weaknesses effectively. Technologies that facilitate e-learning often include personalized learning features, which help in catering to the specific needs of each learner. Sharma and Sahu (2019) found that personalized learning plans facilitated through e-learning platforms led to a notable increase in students' grades, as tailored programs addressed individual strengths and weaknesses effectively. Tools such as gamification, interactive simulations, and virtual reality can lead to a more immersive learning experience, making complex subjects more accessible and stimulating for learners. Personalized learning experiences have been facilitated through adaptive learning technologies, which tailor educational content to meet individual student needs. The engaging nature of these platforms encourages active learning and critical thinking among students. E-learning is currently gaining substantial attention in education and for this reason; several educational institutions are now pursuing application of electronic learning programs.

E-learning has significantly transformed educational practices globally, offering new pathways to learning that transcend conventional classroom settings. In Nigeria, the adoption of e-learning tools in secondary education has gained attention, particularly during and after the COVID-19 pandemic, which forced educational institutions to pivot towards online learning methods. At the senior secondary school level, e-learning is particularly valuable due to its flexibility and ability to cater to diverse learning styles. Digital resources such as videos, simulations, and interactive exercises make abstract concepts in computer studies more accessible and engaging. E-learning also supports collaborative learning, allowing students to interact with peers and teachers beyond the classroom. This shift has been particularly significant in subjects like computer studies, where technological proficiency is both a learning goal and a means of instruction. Computer studies as a subject is uniquely positioned to benefit from e-learning due to its inherent reliance on technology. E-learning platforms can provide practical experiences, simulations, and up-to-date content that traditional textbooks may lack. The use of e-learning in computer studies not only enhances students' academic performance but also equips them with essential digital skills for future careers. It offers a dynamic and interactive approach to teaching complex concepts and practical skills. Students can access instructional materials, virtual labs, and collaborative tools to deepen their understanding of computer science principles and software applications. The integration of e-learning in computer science education has the potential to positively impact the academic performance of senior secondary school students by providing personalized, interactive, and engaging learning experiences.

A study carried out by Abayomi & Olatunde (2021) found that students who engaged in e-learning exhibited improved retention of information compared to those who relied solely on conventional teaching methods. Similarly, Njoku et al. (2022) noted that the integration of e-learning in computer studies, specifically, has fostered greater engagement among students, ultimately enhancing their academic performance in technology-related subjects. Secondary school students who generally participate in online or e-learning achieve far better amounts compared to secondary school students who examined traditional methods. Due to emergence of advancements in educational technology, e-learning is currently gaining substantial attention in education and for this reason; several educational institutions are now pursuing application of electronic learning programs. However, despite these potential benefits, challenges such as inadequate infrastructure, limited access to technology, and varying levels of digital literacy among students in Jos North create a complex landscape that warrants closer examination. As stated by Aboagye et al. (2023), the digital divide remains a significant barrier to the effective implementation of e-learning, affecting students' performance.

The effectiveness of e-learning depends on factors such as the availability of ICT infrastructure, teachers' readiness to use digital tools, and students' access to reliable internet and devices. The integration of e-learning into secondary education has transformed how students access knowledge, interact with content, and demonstrate academic achievement. E-learning leverages digital platforms, multimedia resources, and interactive tools to deliver educational content beyond the confines of conventional classrooms.

II. STATEMENT OF THE PROBLEM

In Jos North local government area of Plateau State, where Socio-economic factors and infrastructural challenges may influence the implementation of learning, it is essential to evaluate to what extent e-learning impact students' academic performance particularly in computer studies as this will help to taking informed and relevant decisions regarding implementation. The impact of e-learning on the academic performance of senior secondary school students in computer studies is a significant area of research because it will Understanding how e-learning platforms and tools affect student learning outcomes can help students and teachers in designing effective strategies to improve the quality of education. It can help to explore the effectiveness in using e-learning platform and the overall impact on student performance in computer studies as a subject. This research can provide valuable insights that can inform decision-making and policy development in the education sector, ultimately leading to improved learning outcomes for students in Jos North Local government area. The Federal Ministry of Education has recognized the importance of integrating e-learning into education, but the actual execution at the local level often varies. According to a report by the National Bureau of Statistics (2020), only 30% of schools in Nigeria have access to reliable internet services, which raises concerns about the effectiveness of e-learning initiatives.

Therefore, there is a problem in understanding the specific impact that e-learning has on the academic performance of senior secondary school students in computer studies which why this research is needed so that it will assess how e-learning specifically influences the academic performance of senior secondary school students in computer studies. This is crucial as computer science is a field where students' performance can be greatly influenced by the quality of their learning experiences.

PURPOSE OF THE STUDY : This study aims to investigate the impact of e-learning on the academic performance of senior secondary school students in computer studies in Jos North Local Government Area, Plateau State. Specifically, the study seeks to:

1. Examine whether the integration of e-learning platforms and tools leads to significant improvements in students' academic performance in Computer Studies.
2. Examine the factors that influence the effectiveness of e-learning in improving students' academic performance in computer studies such as access to technology, training and students' engagement.
3. Examine the effect of e-learning on the motivation levels of senior secondary school students with the goal of understanding how digital learning tools influence student engagement and academic enthusiasm in computer studies.
4. Determine the academic performance of students taught using e-learning integrated with conventional methods of teaching and those taught using conventional methods alone in Computer Studies.

RESEARCH QUESTIONS

The following research questions are formulated for the study

1. To what extent does the integration of e-learning tools in instructional delivery impact the academic performance of senior secondary school students in Computer Studies in Jos North Local Government Area.
2. What are the key factors such as access to technology, technical skills, and student engagement that influence the effectiveness of e-learning in improving the academic performance of senior secondary school students in computer studies?
3. What is the effect of e-learning on the motivation levels of senior secondary school students, and how do digital learning tools influence their engagement and academic enthusiasm in computer studies?
4. To what extent does the academic performance of senior secondary school students in Computer Studies be compared between those taught using a combination of e-learning and conventional teaching methods and those taught using conventional methods alone?

RESEARCH HYPOTHESIS

1. The integration of e-learning tools in instructional delivery has no significant impact on the academic performance of senior secondary school students in Computer Studies in Jos North Local Government Area.

2. Access to technology, technical skills, and student engagement do not have a significant influence on the effectiveness of e-learning in improving the academic performance of senior secondary school students in computer studies.
3. The use of e-learning platforms and digital tools has no significant effect on the motivation, of senior secondary school students in computer studies in Jos North Local Government Area.
4. There is no significant difference in the academic performance of students taught using e-learning integrated with conventional methods and those taught using conventional I methods alone in Computer Studies.

III. METHODOLOGY

This study adopted a quasi-experimental research design using the pre-test and post-test control group method. This design was considered appropriate because it enables the researcher to assess the impact of e-learning by comparing the academic performance of two groups: one exposed to e-learning tools alongside the traditional method (experimental group) and another exposed only to traditional teaching methods (control group). This design also allows for a controlled observation of the changes in students' academic performance, ensuring a more reliable and valid conclusion. According to Creswell (2019), population is defined as a group of individuals or entities with some common characteristic that the researcher plans to study with the aim of generalizing the findings about the population. The population for this study comprised of 1060 students out the 22 senior secondary schools in Jos North Local Government Area (Educational Research Centre 2023), from which also the sample size will be drawn. A sample is a smaller group obtained from the accessible population. A sample of 100 SS2 students was selected from two public secondary schools in Jos North Local Government Area. One school was assigned as the experimental group where students were taught using e-learning tools integrated with traditional methods, while the school served as the control group, using only traditional teaching methods

Sampling technique is a scientific or rather statistical method of selecting the sampling units that would offer the requisite estimates with their related margin of uncertainty; this would emerge from the probe of any part (sample) and not the whole population (Saunders, 2012). The purposive sampling technique was used to select the two secondary schools involved in the study. This technique was adopted because the selected schools possessed functional computer laboratories and internet access necessary for implementing e-learning tools. Students were also purposively selected based on their enrolment in SS2 Computer Studies classes and their availability and willingness to participate in the study. one of the selected schools was designated for the experimental group, and the other for the control groups

Table 1: Sample size of the Data

S/N	Study Unit	Sample size	Experimental	Control
1	SS II	47	25	22
2	SS II	53	32	21
	Total	100	57	43

The instruments used for data collection were the Academic Achievement Test (AAT) in Computer Studies and a structured questionnaire titled "E-Learning Impact Assessment Questionnaire (ELIAQ)" The Academic Achievement Test is a researcher-developed test, designed to measure students' academic achievement in Computer Studies before and after an instructional intervention, as well as to compare the impact of e-learning and traditional teaching methods on students' academic performance. The E-Learning Impact Assessment Questionnaire is a structured instrument used to gather information on students' access to technology, motivation, engagement with digital tools, and perceptions of e-learning. Both instruments were used to collect data relevant to the objectives of the study.

IV. RESULT

The results of the analysed data have been classified into two parts namely; the analysis of research questions using descriptive statistics and the results of the hypotheses tested using inferential statistics respectively.

Table 2: Gender of respondents

S/N	Gender	Frequency	Percentage
1	Male	53	53.0
2	Female	47	47.0
Total		100	100

Source: Field Survey, 2025 (SPSS output)

The data in Table 2 presents the gender distribution of respondents. Out of a total of 100 respondents, 53 (53.0%) were male while 47 (47.0%) were female. This shows that the sample used for the study was approximately equally distributed by gender, with a slight majority of male respondents.

Table 3: Age distribution of respondents

S/N	Age group	Frequency	Percentage
1	15–16	44	44.0
2	17–18	46	46.0
3	19 Years and above	10	10.0
Total		100	100

Source: Field Survey, 2025 (SPSS output)

Table 3 shows the age distribution of respondents. The majority of respondents (46.0%) were in the 17–18 age group, while 44.0% were aged 15–16 and 10.0% were 19 years and above. This distribution is consistent with a senior secondary school sample where most students fall within the 15–18 age range.

Table 4: Access to smartphone/computer at home

S/N	Access to device at home	Frequency	Percentage
1	Yes	79	79.0
2	No	21	21.0
Total		100	100

Source: Field Survey, 2025 (SPSS output)

Table 4 indicates that the majority of respondents (79.0%) reported having access to a smartphone or computer at home, while 21.0% did not have such access. This suggests reasonably high access to digital devices among the sampled students.

Table 5: Prior use of e-learning platforms

S/N	Used e-learning before	Frequency	Percentage
1	Yes	71	71.0
2	No	29	29.0
Total		100	100

Source: Field Survey, 2025 (SPSS output)

Table 5 shows that 71.0% of respondents had used an e-learning platform prior to this study, while 29.0% had not. This high prior exposure may influence positive perceptions of e-learning reported in the study.

Research Question 1: To what extent does the integration of e-learning tools in instructional delivery impact the academic performance of Senior Secondary School students in Computer Studies?

Table 6: Response on the impact of e-learning integration on academic engagement and understanding in Computer Studies

S/N	Statement	Mean	SD	Decision
1	E-learning has increased student interest in Computer Studies.	3.080	0.956	Agreed
2	E-learning has helped students to understand difficult computer topics better.	3.310	0.845	Agreed
3	student participate more actively during e-learning sessions than in traditional classes.	3.120	0.930	Agreed
4	students retain information better when I learn using e-learning tools.	3.115	0.895	Agreed
5	E-learning encourages me to study even outside the classroom.	3.225	0.809	Agreed

Source: field survey, 2025

Valid N (listwise): 100

Criterion Mean: 3.00

Cumulative Mean (RQ1): 3.072

The results in Table 6 show mean scores and standard deviations of items constructed to answer research question one. From the results presented, it was observed that the mean ratings of the responses were 3.080, 3.310, 3.120, 3.115, and 3.225 respectively, with the corresponding standard deviations of 0.956, 0.845, 0.930, 0.895, and 0.809. Since all the mean ratings were above the criterion mean of 3.00, it implies that respondents agreed that e-learning has increased students' interest in Computer Studies, helped them understand difficult computer topics better, encouraged more active participation during e-learning sessions, improved information retention through e-learning tools, and motivated them to study even outside the classroom. This indicates that the integration of e-learning has a positive impact on students' academic engagement and understanding in Computer Studies.

Research Question 2: What are the key factors such access to technology, technical Skills and students' engagement that influence the effectiveness of e-learning in improving the academic performance of senior secondary school students in computer studies?

Table 7: Response on the key factor that influence the effectiveness o e-learning.

S/N	Statement (Item)	Mean	SD	Decision
1	Students have received adequate training or guidance on how to use e-learning platforms effectively.	3.170	0.930	Agreed
2	Students have easy and consistent access to digital devices for learning.	3.140	0.980	Agreed
3	have received adequate training and orientation on how to use e-learning tools for Computer Studies.	3.050	1.020	Agreed
4	Computer teachers have provided enough guidance and support in using digital learning platforms.	3.140	0.980	Agreed
5	Students receive assistance at home when using e-learning tools.	2.950	1.004	Disagreed

Source: field survey, 2025

Valid N (listwise): 100

Criterion Mean: 3.00

Cumulative Mean (RQ2): 3.050

The results in Table 7 show mean scores and standard deviations of items constructed to answer research question two. From the results presented, it was observed that the mean ratings of the responses were 3.170, 3.140, 3.050, 3.140, and 2.950 respectively, with the corresponding standard deviations of 0.930, 0.980, 1.020, 0.980, and 1.004. Since four of the mean ratings were above the criterion mean of 3.00, it implies that respondents agreed that students have received adequate training or guidance on how to use e-learning platforms effectively, have easy and consistent access to digital devices for learning, have received adequate orientation on

how to use e-learning tools for Computer Studies, and that computer teachers have provided sufficient guidance and support in using digital learning platforms. However, respondents disagreed that students receive adequate assistance at home when using e-learning tools. The cumulative mean of 3.050, which is above the criterion mean, suggests that access, training, and teacher engagement are the key factors that significantly influence the effectiveness of e-learning, although limited home support remains a challenge to its optimal utilization.

Research Question 3: What is the effect of e-learning on the motivation levels of senior secondary school students, and how do digital learning tools influence their engagement and academic enthusiasm in computer studies?

Table 8: Response on the effect of e-learning on motivation and academic enthusiasm in Computer Studies

S/N	Statement	Mean	SD	Decision
1	Students perform better in tests when e-learning is used.	3.150	0.953	Agreed
2	E-learning has helped me to understand difficult computer topics better.	2.900	0.964	Disagreed
3	The combination of e-learning and classroom teaching improves my academic performance.	2.980	1.068	Disagreed
4	Students retain information better when they learn using e-learning tools.	3.100	0.954	Agreed
5	Item15: Students feel more motivated to study using digital tools.	3.080	0.913	Agreed

Source: field survey, 2025

Valid N (listwise): 100

Criterion Mean: 3.00

Cumulative Mean (RQ3): 3.042

The results in Table 8 show mean scores and standard deviations of items constructed to answer research question three. From the results presented, it was observed that the mean ratings of the responses were 3.150, 2.900, 2.980, 3.100, and 3.080 respectively, with the corresponding standard deviations of 0.953, 0.964, 1.068, 0.954, and 0.913. Since three of the mean ratings were above the criterion mean of 3.00, it implies that respondents agreed that students perform better in tests when e-learning is used, retain information better when learning through e-learning tools, and feel more motivated to study using digital tools. However, respondents disagreed that e-learning alone helps them understand difficult computer topics better and that combining e-learning with classroom teaching significantly improves their academic performance. The cumulative mean of 3.042, which is slightly above the criterion mean, indicates that e-learning has a generally positive effect on students' motivation and academic enthusiasm in Computer Studies, although its impact may be enhanced when effectively integrated with traditional teaching methods.

Research Question 4: What is the difference in academic performance between students taught using e-learning combined with Conventional methods and those taught using conventional methods alone?

Table 9: academic performance between students taught using e-learning combined with traditional methods and those taught using conventional methods alone

	E-learning and Traditional (Experimental Group)		Conventional (Control Group)	
	Pre-Test	Post-Test	Pre-Test	Post-Test
Mean	8.93	16.60	7.10	11.60
SD	1.67	1.88	1.36	1.66

Source: field survey, 2025

Table 9 presents the mean scores and standard deviations (SD) of Computer Studies tests for both experimental and control groups, before and after they were exposed to different instructional methods. In the experimental group (students taught using e-learning combined with traditional methods), the mean score increased notably from 8.93 in the pre-test to 16.60 in the post-test, with the standard deviation slightly increasing from 1.67 to 1.88. This indicates that students in the experimental group showed a marked improvement in their academic performance after exposure to e-learning, although there was a slight increase in score variation among them.

In the control group (students taught using conventional methods alone), the mean score also showed improvement, rising from 7.10 in the pre-test to 11.60 in the post-test, while the standard deviation changed slightly from 1.36 to 1.66. This shows some academic progress among students taught using the traditional method; however, the level of improvement was considerably lower than that of the experimental group. Overall, the results suggest that the integration of e-learning with traditional teaching methods had a greater positive impact on students' academic performance in Computer Studies compared to the conventional method alone, highlighting the effectiveness of blended learning in enhancing student achievement. The integration of e-learning with conventional teaching methods significantly improves the academic performance of SSS 2 students in Computer Studies. The experimental group exposed to blended learning showed a marked increase in mean test scores from pre-test to post-test compared to the control group taught with conventional methods only. E-learning enhances students' interest in Computer Studies, helps them understand complex computer topics better, encourages more active participation during lessons, supports better information retention, and motivates students to study beyond the classroom. Key factors that influence the effectiveness of e-learning include adequate student training on e-learning platforms, consistent access to digital devices, sufficient guidance and support by teachers in using digital learning tools. However, there is inadequate home or parental support in assisting students with e-learning. E-learning alone does not significantly improve motivation and engagement levels; it works best when combined with conventional classroom teaching. Chi-square statistical tests confirmed a significant difference in academic performance between students taught by blended learning as opposed to conventional methods alone. Most Senior Secondary School students (79%) had access to smartphones or computers at home, and a majority (71%) had prior experience using e-learning platforms, which positively influenced their academic engagement. Challenges limiting optimal e-learning utilization included unequal access to technology, infrastructural deficits such as inconsistent power and internet supply, digital literacy disparities among students, and limited support at home.

V. CONCLUSION

The research concludes that. E-learning increases interest and comprehension among senior secondary students in SSS 2 fostering better knowledge retention and overall academic performance. The integration of e-learning with conventional teaching methods significantly improves students' academic performance in Computer Studies. E-learning positively influences students' interest and motivation in studying Computer Studies by making learning more interactive and accessible, thus encouraging greater participation and retention of educational material. Effective implementation of e-learning requires adequate training for students on digital platforms, access to necessary technological devices, continuous teacher support, and a supportive home environment, though the last remains a challenge. The use of e-learning alone does not sufficiently enhance motivation and engagement; the combination of e-learning and traditional teaching is crucial to achieve significant improvement in these areas. Infrastructure challenges in schools such as inconsistent power supply, poor internet connectivity, and limited access to digital devices constrain the full potential of e-learning. Addressing these infrastructural gaps is essential for the sustainability of ICT-based education. The research underscores the need for ongoing government support, investment in digital infrastructure, and comprehensive training programs for both teachers and students to maximize the benefits of e-learning in enhancing educational outcomes.

RECOMMENDATIONS

1. Prioritize blended learning: Integrate e-learning platforms with face-to-face instruction to optimize student outcomes.
2. Provide training programs: Regular, comprehensive training and orientation for students and teachers on effective use of e-learning tools.
3. Promote parental and community support: Develop sensitization programs to encourage support for students' use of e-learning resources at home.
4. Improve device access: Enhance availability of smartphones, laptops, or tablets, especially for disadvantaged students.
5. Upgrade infrastructure: Ensure stable power supply, internet connectivity, and well-equipped computer labs.

6. Implement continuous assessment: Use ongoing assessment and feedback to monitor progress and adjust e-learning delivery.
7. Encourage computer clubs: Promote collaborative projects and peer learning for practical computer science skills.

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