Impact of Digital Learning Platform Utilization on Student Academic Performance in Polytechnics of North-East Nigeria

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Abstract
This study investigates the relationship between digital learning platform utilization and student academic performance in polytechnics of North-East Nigeria. Amid increasing adoption of ICT-based educational tools, infrastructural, technological, and socio-economic challenges influence the effective use of digital platforms. Employing a quantitative survey design, data were collected from students via structured questionnaires and analyzed using statistical methods including Pearson correlation and regression analysis. The findings reveal a significant positive correlation between the extent of digital platform utilization and academic achievement, highlighting the potential of digital resources to enhance learning outcomes. However, infrastructural deficits, limited digital literacy, high internet costs, and unreliable power supply hinder optimal utilization. The study recommends enhancing ICT infrastructure, providing affordable internet access, continuous digital literacy training, and policy support to maximize the benefits of digital learning in polytechnics. The results underscore the importance of addressing infrastructural and capacity-building gaps to improve educational quality and student performance in the region.

Keywords: *Digital learning platforms, Academic performance, Polytechnic education, North-East Nigeria, ICT infrastructure, E-learning, Student engagement, Educational technology challenges*

I. Introduction

The rapid advancement of Information and Communication Technology (ICT) has transformed the landscape of education worldwide, fostering innovative teaching and learning methods through digital platforms. Digital learning technologies—such as Learning Management Systems (LMS), virtual classrooms, online assessments, and collaborative tools—have shown numerous benefits, including enhanced student engagement, access to diverse learning resources, and improved academic outcomes (Richardson et al., 2021; Bond et al., 2021).

In Nigeria, tertiary institutions—particularly polytechnics—have increasingly integrated digital learning platforms into their academic processes to improve learning experiences and outcomes. The COVID-19 pandemic further accelerated this trend, compelling institutions to adopt online and blended learning modalities rapidly. Despite these efforts, the adoption and effective utilization of digital learning technologies remain inconsistent across Nigerian polytechnics, especially in the North-East region.

The North-East Nigeria faces unique challenges, including infrastructural deficits, socio-economic constraints, and security issues, which impede the widespread and effective implementation of digital education. Factors such as inadequate ICT infrastructure, unreliable electricity, high internet costs, low digital literacy, and limited institutional support hinder students' ability to fully benefit from digital learning tools. These barriers potentially limit the positive impact of digital platforms on student academic performance and require comprehensive investigation to inform actionable strategies.

Given this context, understanding the specific barriers and facilitators influencing digital learning adoption in North-East Nigerian polytechnics is vital. Such insights could guide policymakers, institutional administrators, and educators toward creating enabling environments that enhance digital learning practices and, consequently, improve student achievement.

Statement of the Problem

While digital learning platforms have become integral to higher education worldwide, their implementation in Nigerian polytechnics, particularly in North-East Nigeria, encounters numerous challenges. Despite increased investments and the proliferation of digital tools, many students and lecturers face significant obstacles—such as infrastructural limitations, high internet costs, and low digital literacy—that restrict effective utilization.

This situation raises concerns about the actual impact of digital learning adoption on student academic achievement within the region. Are the infrastructural and socio-economic barriers impeding the potential benefits of digital platforms? What are the key facilitators that can enhance their effective use? Addressing these questions is critical for developing targeted interventions to optimize digital learning and foster improved academic outcomes.

Despite the recognition of these issues, there is limited empirical research specifically examining both the barriers and facilitators of digital learning adoption in North-East Nigerian polytechnics. Therefore, this study aims to bridge this gap by investigating these factors and their implications on student achievement.

Aim and Objectives of the Study

The aim of this study is to examine the barriers and facilitators influencing the adoption of digital learning platforms in North-East Nigerian polytechnics and their implications for student achievement.

Specific Objectives:

1. To identify the key barriers hindering the effective utilization of digital learning platforms among students and lecturers.
2. To determine the facilitators that promote digital learning adoption in the region.
3. To assess the relationship between digital learning platform usage and student academic performance.

Research Questions

In line with the objectives, this study seeks to answer the following questions:

1. What are the primary barriers affecting the adoption and utilization of digital learning platforms among students and lecturers in North-East Nigerian polytechnics?
2. What facilitators or enabling factors support digital learning adoption in these institutions?
3. How does the level of digital learning platform utilization correlate with student academic

performance?

II. Literature Review

Concept of Digital Learning in Higher Education

Digital learning, also known as e-learning or online learning, refers to the use of digital technologies to facilitate teaching and learning processes remotely or in hybrid formats. It encompasses a broad range of tools—including Learning Management Systems (LMS), virtual classrooms, discussion forums, online assessments, educational mobile apps, and multimedia content—that enhance access, engagement, and personalized learning experiences (Al-Fraihat et al., 2020). In higher education, digital learning offers the potential for flexible study schedules, resource-rich environments, and opportunities for collaboration beyond geographical barriers. Multiple studies indicate that when effectively utilized, digital platforms can improve knowledge acquisition, critical thinking, and academic performance (Dhawan, 2020; Bond et al., 2021).

Digital Learning Adoption in Nigerian Polytechnics

Nigerian polytechnics have begun integrating digital learning platforms into their curricula, particularly following the COVID-19 pandemic's disruption of traditional classroom instruction. Institutions leverage various tools such as Moodle, Google Classroom, and proprietary LMS to deliver course content, facilitate discussions, and conduct assessments (Federal Ministry of Education, 2022). However, despite increased adoption, many challenges hinder effective utilization, including infrastructural deficits, limited technical capacity, and socio-economic disparities. Existing literature indicates that infrastructure constraints such as unreliable electricity, insufficient ICT facilities, and high internet costs significantly impede digital learning strategies in Nigeria (UNESCO, 2023; Shehu, 2024).

Additionally, studies reveal that digital literacy levels among students and lecturers vary widely, affecting the degree to which digital platforms can be employed effectively (Adeagbo, 2021). The uneven pace of digital transformation necessitates a comprehensive understanding of the barriers and facilitators specific to the Nigerian polytechnic context.

Barriers to Digital Learning Adoption

Numerous factors limit the effective utilization of digital learning platforms in Nigerian polytechnics. These include:

Infrastructural Challenges

Inadequate ICT infrastructure, such as limited access to computers, unreliable internet, and poor network coverage, is a primary barrier. UNESCO (2023) reports that in many Nigerian regions, especially rural and conflict-affected areas, internet connectivity remains unstable and inaccessible.

Power Supply Issues

Frequent power outages limit the usability of digital tools, forcing reliance on personal generators or alternative energy sources, which may be costly or unavailable (Shehu, 2024).

Financial Constraints

High internet data costs and limited funding for ICT development restrict students' and institutions' capacity to adopt digital platforms consistently (Federal Ministry of Education, 2022).

Digital Literacy Deficits
Many students and lecturers lack sufficient digital literacy skills needed to navigate and utilize online learning systems effectively, reducing engagement and learning outcomes (Adeagbo, 2021).

Sociocultural and Security Concerns
Cultural attitudes, resistance to change, and security issues in North-East Nigeria further complicate digital learning adoption by influencing perceptions and access.

Facilitators of Digital Learning Adoption
Conversely, several factors facilitate the successful integration of digital platforms:
Infrastructure Improvement
Investments in ICT infrastructure—including reliable electricity, high-speed internet, and digital devices—are crucial. UNESCO (2023) emphasizes that well-equipped institutions experience higher levels of digital engagement.

Capacity Building and Digital Literacy Training
Ongoing training programs for lecturers and students enhance confidence and competence in using digital tools effectively (European Commission, 2022).

Institutional Support and Policy Frameworks
Supportive institutional policies, inclusion of digital literacy in curricula, and strategic planning foster a conducive environment for digital learning (Asogwa et al., 2022).

Public-Private Partnerships (PPPs)
Collaborations with telecommunications companies and private sector organizations can provide infrastructure support, affordable data packages, and capacity development.

Socioeconomic Support
Financial assistance, such as scholarship programs or subsidized internet access, reduces economic barriers to digital resource utilization.

Digital Learning and Student Academic Achievement
Empirical studies indicate that effective use of digital platforms correlates positively with students' academic achievements, including better grades, research skills, and engagement (Bond et al., 2021; Richardson et al., 2021). In Nigerian polytechnics, research shows that digital resource accessibility enhances learning outcomes, provided infrastructural and skills barriers are addressed (Federal Ministry of Education, 2022).
However, when barriers impede use, the potential gains diminish, leading to disparities in access and performance (UNESCO, 2023). Therefore, understanding the balance between facilitators and barriers is essential for optimizing digital learning's impact.

Gaps in Literature
While prior studies have examined e-learning and digital literacy in Nigerian higher education, focus has predominantly been on universities in urban areas. Limited empirical research exists on polytechnics, particularly in the North-East, where infrastructural and security challenges are

more pronounced (Shehu, 2024). Additionally, existing literature often emphasizes barriers without equally exploring facilitators or the direct impact on academic achievement within the regional context. This study aims to fill these gaps by investigating both barriers and facilitators of digital learning adoption in North-East Nigerian polytechnics and assessing their influence on student performance.

III. Methodology

Research Design

The study adopts a **descriptive survey research design**. This approach allows for the systematic collection of quantitative data to describe and examine the current status of digital learning adoption, identify barriers and facilitators, and determine their relationship with student academic performance in the selected polytechnics.

A correlational study complements the survey to assess the relationships between variables such as infrastructure availability, digital literacy, and academic achievement.

Population of the Study

The target population comprises **students** enrolled in **National Diploma (ND)** and **Higher National Diploma (HND)** programs across selected polytechnics in North-East Nigeria. The population includes both male and female students actively using or having access to digital learning platforms. In addition, the study considers **lecturers** involved in teaching and facilitating digital learning activities, as well as **administrators** responsible for policy and infrastructure management within these institutions.

Population Size

Based on institutional records, the combined student population across the selected polytechnics is approximately **5,000 students**, with varying levels of digital platform usage.

Sampling Technique and Sample Size

Sampling Technique

A **multistage sampling approach** is employed:

1. **Purposive sampling** of **polytechnics** in North-East Nigeria that have adopted digital learning platforms.
2. **Stratified random sampling** of students from each institution, stratified by program (ND and HND) to ensure representativeness.
3. **Simple random sampling** within strata to select individual participants.

Sample Size Determination

Using Cochran's formula for a finite population and assuming a 95% confidence level, 5% margin of error, and an expected response rate, the sample size is calculated as follows:

$$n=e^2Z^2 \times p \times (1-p)$$

Where:

- $Z=1.96$ (for 95% confidence)
- $p=0.5$ (population proportion, maximizes sample size)
- $e=0.05$ (margin of error)

Calculations yield a minimum sample size of approximately **385 students**. Considering a 10% non-response rate, the final sample size is adjusted to **424 students**.

Similarly, for lecturers and administrators, a proportionate sample will be selected.

Data Collection Instruments

The primary data collection instrument is a **structured questionnaire** comprising sections on:

- Demographics
- Digital learning platform usage and frequency
- Perceived barriers and facilitators
- Academic performance indicators (self-reported grades, GPA)
- Institutional support and infrastructure perception

Additional interview guides and checklists may be used to gather qualitative insights from key stakeholders.

Validation of Instruments

The questionnaire was undergoing **content validation** by a panel of experts in educational technology and education management. A **pilot test** was conducted on a small sample (not included in the main study) to assess clarity and coherence, with subsequent revisions made.

Reliability

The internal consistency of the questionnaire scales was measured using **Cronbach's alpha**, with a threshold of 0.70 for acceptability.

Data Collection Procedures

- Ethical approval was obtained from relevant Institutional Review Boards.
- Official permission from polytechnic authorities will be secured.
- Participants were briefed on the purpose of the study and their voluntary participation, and informed consent will be obtained.
- Data collection was occurred over a period of 4 weeks, with questionnaires administered either physically or electronically, depending on accessibility.

Data Analysis

Data was coded and entered into **SPSS** (Statistical Package for the Social Sciences) for analysis.

Descriptive Statistics

- Frequencies and percentages was describe demographic data and digital platform usage.
- Means and standard deviations was measure perceptions of barriers and facilitators.

Inferential Statistics

- **Pearson's Product Moment Correlation** was assessed relationships between digital learning factors and academic performance.
- **Multiple regression analysis** was identified the most significant predictors of student achievement.
- **ANOVA or t-tests** may compare groups based on demographic variables.

Statistical significance was be set at $\mathbf{p < 0.05}$.

IV. Results and Discussion

Demographic Characteristics of Respondents

Table 4.1: Distribution of Respondents by Gender

Gender	Frequency	Percentage (%)
Male	55	68.8
Female	25	31.2
Total	80	100.0

Source: Field Survey, 2026.

The table indicates that a majority of respondents were male (68.8%), while females constituted 31.2% of the sample. This suggests a gender imbalance that may reflect the general demographic distribution in the participating polytechnics or could influence how digital learning platforms are utilized across genders. Such demographic information is crucial for understanding potential disparities in digital access and engagement.

Distribution of Respondents by Age

Table 4.2: Distribution of Respondents by Age

Age	Frequency	Percentage (%)
Below 18 years	2	2.5
18–22 years	35	43.8
23–27 years	31	38.8
28 years and above	10	12.5
Missing response	2	2.5
Total	80	100.0

Source: Field Survey, 2026.

Most respondents (82.6%) fell within the 18–27 years age range, indicating that the majority of participants are young adults actively engaged in their tertiary education. The age distribution is typical for polytechnic students, and this demographic may influence their familiarity and comfort with digital platforms.

Digital Learning Platform Utilization and Perceived Academic Benefits

Table 4.3: Digital Learning Platform Utilization and Perceived Academic Benefits

Item	Mean	SD	Decision
Digital learning platforms have improved my academic performance	4.16	0.87	Agree
My understanding of course materials has improved through digital learning	4.03	0.83	Agree
Digital learning platforms have helped me improve my grades	4.04	0.89	Agree

Item	Mean	SD	Decision
I complete assignments more effectively using digital platforms	3.97	0.91	Agree
Digital learning has improved my examination preparation	4.09	0.71	Agree
Digital learning has increased my classroom participation	3.86	0.94	Agree
I achieve better learning outcomes when using digital platforms	4.08	0.68	Agree
Digital platforms have improved my research skills	4.39	0.59	Agree
Digital learning motivates me to study more frequently	4.14	0.69	Agree
Overall, digital learning has positively influenced my academic success	4.08	0.83	Agree

Source: Field Survey, 2026.

The high mean scores across items demonstrate that students generally perceive digital learning platforms as significantly beneficial for their academic success. Particularly, the statement that platforms improved research skills scored the highest (M=4.39), highlighting the role of digital tools in enhancing research and information gathering abilities. These findings suggest a positive attitude toward digital platforms, aligning with previous research indicating that technology enhances academic engagement and achievement.

Academic Performance Indicators

Table 4.4: Students' Perceptions of Academic Performance through Digital Learning

Academic Performance Indicator	Mean	SD	Decision
Digital learning platforms have improved my academic performance	4.02	0.91	Agree
My understanding of course materials has improved through digital learning	4.05	0.84	Agree
Digital learning platforms have helped me improve my grades	4.03	0.89	Agree
I complete assignments more effectively using digital platforms	4.01	0.91	Agree
Digital learning has improved my examination preparation	4.06	0.86	Agree
Digital learning has increased my classroom participation	4.02	0.86	Agree
I achieve better learning outcomes when using digital platforms	4.07	0.84	Agree
Digital platforms have improved my research skills	4.04	0.85	Agree
Digital learning motivates me to study more frequently	4.03	0.83	Agree
Overall, digital learning has positively influenced my academic success	4.06	0.86	Agree

Source: Field Survey, 2026.

Similarly, respondents' perceptions of the influence of digital learning on their academic performance were overwhelmingly positive, with a grand mean of 4.04. The consistency across items suggests that students attribute significant academic benefits to digital platforms, reinforcing their importance in modern educational contexts.

Challenges Affecting Digital Learning Platform Utilization

Table 4.5: Challenges Affecting the Use of Digital Learning Platforms

Challenge	Mean	SD	Decision
Poor internet connectivity limits my use of digital learning platforms	3.99	1.06	Agree
High cost of internet data affects my participation	3.95	0.94	Agree
Frequent power outages affect my use	3.87	0.94	Agree
I lack adequate digital skills to fully utilize learning platforms	3.66	1.10	Agree
My institution provides inadequate ICT facilities	3.74	1.09	Agree
Technical problems discourage use	3.61	1.11	Agree
Some lecturers do not effectively use digital platforms	3.59	1.05	Agree
Digital learning platforms are sometimes difficult to navigate	3.55	1.12	Agree
Lack of personal digital devices	3.84	0.96	Agree
Poor network coverage reduces participation	4.05	0.88	Agree

Source: Field Survey, 2026.

The respondents acknowledged multiple infrastructural, technical, and financial barriers hindering effective utilization of digital learning platforms. Notably, poor network coverage and internet costs had the highest scores, highlighting systemic issues that need addressing to maximize digital learning benefits.

Measures for Improving Digital Learning Platform Utilization

Table 4.6: Measures for Improving Digital Learning Platforms

Suggested Measure	Mean	SD	Decision
Improved internet access	4.33	0.74	Agree
Affordable internet data plans	4.31	0.77	Agree
Regular ICT training for students	4.47	0.60	Agree
Continuous training for lecturers	4.32	0.87	Agree
Improved ICT infrastructure	4.39	0.73	Agree
Reliable electricity supply	4.42	0.62	Agree
Readily available technical support	4.33	0.72	Agree
More online learning resources	4.24	0.94	Agree
Increased government funding	4.43	0.79	Agree
Improving digital learning platforms	4.36	0.58	Agree

Source: Field Survey, 2026.

Students and respondents strongly supported comprehensive measures to facilitate digital learning, especially ICT training, infrastructure enhancement, and increased funding. The highest

mean was for regular ICT training, underscoring its importance for improving digital literacy and effective system use.

Relationship between Digital Learning Utilization and Academic Performance

Table 4.7: Pearson Correlation between Digital Learning Platform Utilization and Academic Performance

Variables	N	Pearson r	Sig. (2-tailed)	Decision
Digital learning platform utilization	80	0.774	<0.001	Significant
Student academic performance	80	0.774	<0.001	Significant

Source: Field Survey, 2026.

The correlation coefficient of 0.774 indicates a strong, positive, and significant relationship between digital platform utilization and academic performance. This finding corroborates existing literature suggesting

Discussion of findings

- The discussion of findings from the study reveals several critical insights into the relationship between digital learning platform utilization and students' academic performance in polytechnics of North-East Nigeria.

Firstly, the study found that students generally perceive digital learning platforms as beneficial to their academic activities, with a high overall agreement (mean = 4.07). Specifically, digital platforms were acknowledged to enhance understanding of course materials, research skills, examination preparation, motivation, and overall academic outcomes. The highest-rated benefit was the improvement in research skills, indicating that digital platforms provide students with better access to information and facilitate academic research.

Secondly, the study established a significant and strong positive correlation ($r = 0.774$, $p < 0.001$) between digital learning platform utilization and academic performance. This indicates that increased use of digital platforms is associated with better academic outcomes, supporting the premise that digital engagement enhances educational achievement in the polytechnic context. However, the findings also highlighted substantial challenges that hinder effective utilization of digital learning platforms. Major obstacles included poor network coverage, unreliable internet connectivity, high internet data costs, frequent power outages, limited ICT infrastructure, and insufficient digital skills among students and lecturers. These infrastructural and socioeconomic factors constrain the potential benefits of digital learning and point to the necessity for targeted interventions. Furthermore, the respondents strongly supported measures to improve digital learning utilization. These include regular ICT training, improved infrastructure, reliable electricity supply, increased government funding, accessible internet, and technical support. Such measures are deemed essential to overcome existing barriers and maximize the positive impact of digital platforms on academic performance.

Conclusion

The study conclusively demonstrates that digital learning platform utilization plays a vital role in enhancing student academic performance in polytechnics of North-East Nigeria. The findings reveal a strong positive correlation, indicating that students who actively engage with digital platforms tend to perform better academically. Despite these benefits, the study also highlights persistent infrastructural, technological, and socioeconomic challenges, such as inadequate ICT

infrastructure, unreliable internet connectivity, high data costs, and limited digital literacy, which hinder effective utilization of digital learning resources. Addressing these barriers is essential to fully harness the potential of digital platforms for improving educational outcomes. Overall, - investing in digital infrastructure, fostering digital skills, and policy support are crucial to leveraging technology-driven learning and achieving better academic achievements in the region.

Recommendations

Firstly, it is recommended that polytechnic management and government authorities collaborate to significantly improve ICT infrastructure within the institutions. This includes investing in modern computer laboratories, reliable internet connectivity, and digital learning resources. Additionally, establishing consistent power supply solutions, such as renewable energy sources, would ensure that digital platforms are accessible at all times. Such infrastructural enhancements will create a conducive environment for digital learning, encouraging greater student engagement and participation. Secondly, comprehensive digital literacy and ICT training programs should be instituted regularly for both students and lecturers. These training initiatives should focus on familiarizing users with learning management systems, online communication tools, and research resources. Equipping students and staff with the necessary digital skills will improve their confidence, facilitate effective use of digital platforms, and ultimately lead to better academic performance. Moreover, government policymakers should increase funding for digital education initiatives, emphasizing affordability of internet data for students and expanding access to digital devices. These combined efforts will help bridge the digital divide and promote an inclusive, technology-enabled educational environment.

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