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The Impact of Digital Learning Tools on Student Performance in Delta State Polytechnic, Otefe-Oghara

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ABSTRACT
The integration of digital learning tools has become increasingly essential in higher education, enhancing student engagement, participation, and academic performance. This study examines the impact of e-learning platforms, interactive smartboards, and educational software on student outcomes at Delta State Polytechnic, Otefe-Oghara. The study employs a quantitative correlational research design, surveying 335 students from an initial sample target of 400. Data were collected using a validated structured questionnaire with a reliability index of 0.78 and analyzed in SPSS using percentage and Pearson correlation analysis to determine the relationships between digital learning tools and key academic performance indicators. The findings of this study indicate that e-learning platforms have a moderate positive impact on student grades ($R = 0.562$, $p = 0.014$), suggesting that students who frequently use platforms like Google Classroom and Zoom perform better academically. Additionally, interactive smartboard usage shows a strong positive correlation with class participation ($R = 0.648$, $p = 0.009$), enhancing student engagement in discussions. Furthermore, educational software use moderately correlates with assignment completion rates ($R = 0.591$, $p = 0.012$), demonstrating its role in improving student productivity and coursework submission timeliness. These results highlight the need for increased investment in digital infrastructure, faculty training, and policy improvements to support technology-driven education. The study contributes to the growing body of research on digital learning adoption in Nigerian polytechnics and recommends further comparative studies across institutions to generalize findings.
Keywords: Digital learning tools, e-learning platforms, interactive smartboards, educational software, student performance, academic participation, technology adoption, polytechnic education

INTRODUCTION

The evolution of digital learning tools has significantly transformed the educational landscape, particularly in tertiary education. Traditional face-to-face learning methods are increasingly supplemented or replaced by digital technologies, which offer greater accessibility, flexibility, and interactive learning experiences (Alam et al., 2021; Al-Fraihat et al., 2020). E-learning platforms, interactive smartboards, and educational software have become essential in academic environments, enabling students to engage with course materials, collaborate with peers, and improve their overall academic performance (Aneke, 2021; Dhawan, 2020). In recent years, institutions worldwide have incorporated these digital tools into their curricula to enhance the quality of education (Franklin & Nahari, 2018). E-learning platforms such as Google Classroom, Moodle, and Blackboard facilitate remote and blended learning by providing access to lecture notes, assignments, and discussion forums (Schmid et al., 2014). Similarly, interactive smartboards allow for real-time student-teacher engagement, making complex concepts easier to visualize and understand (Türel & Johnson, 2018). Educational software, including Microsoft Office, programming

tools, and simulation applications, further supports students in their coursework by providing automated feedback and enhancing problem-solving skills (Emmanuel, 2022).

Despite the advantages, the effectiveness of these digital learning tools in improving student outcomes remains a topic of discussion. Studies have shown that while digital learning tools can enhance engagement and participation, their impact on student performance varies depending on factors such as accessibility, digital literacy, and institutional support (Cheung & Slavin, 2013; Nduka, 2018). Some researchers argue that e-learning platforms can significantly improve student grades by offering personalized learning experiences and self-paced study options (Means et al., 2013; Banjo, 2021). Others highlight the challenges of digital adoption, particularly in developing countries, where issues such as unreliable internet connectivity, inadequate digital infrastructure, and resistance to technology hinder the full benefits of digital education (Yakubu, 2020; Ogueli, 2023). In Nigeria, several tertiary institutions, including Delta State Polytechnic, Otefe-Oghara, have begun integrating digital learning tools into their academic programs to enhance student engagement and improve learning outcomes (Onos, 2019).

While digital learning tools have gained widespread adoption in tertiary education globally, their impact on academic performance in Nigerian polytechnics remains underexplored. Existing studies have primarily focused on universities and technical colleges, with little attention given to polytechnic institutions that cater to a significant proportion of Nigeria's student population (Ogrutan & Aciu, 2020; Nduka, 2018). Previous research has emphasized the effectiveness of e-learning platforms in promoting knowledge retention and enhancing student outcomes, particularly in developed nations where digital education is well-integrated into academic systems (Bowers & Kumar, 2015; Zolochevskaya et al., 2021). However, in Nigeria, challenges such as inadequate funding, lack of ICT infrastructure, and limited digital literacy among students and faculty members continue to hinder the full-scale implementation of digital learning (Umeh, 2021; Yakubu, 2020).

Additionally, research on interactive smartboards and their role in student engagement has predominantly focused on secondary schools and university settings, with limited empirical evidence from polytechnics (Andreevich, 2020; Dhawan, 2020). Interactive smartboards are designed to foster collaborative learning and improve classroom participation, yet their usage in Nigerian polytechnics remains inconsistent due to cost and training limitations (Al-Fraihat et al., 2020; Banjo, 2021). Similarly, while educational software is widely recognized for improving assignment completion rates and fostering independent learning, its accessibility and effectiveness in polytechnic institutions remain unclear (Franklin & Nahari, 2018; Suresh et al., 2018).

Given these gaps, this study seeks to examine the impact of digital learning tools—specifically e-learning platforms, interactive smartboards, and educational software—on student performance at Delta State Polytechnic, Otefe-Oghara. By assessing the correlation between digital learning tools and key academic performance indicators such as student grades, class participation, and assignment completion rates, this study aims to provide empirical evidence to inform policy decisions and digital learning strategies in Nigerian tertiary institutions.

Aim and Objectives

1. To examine the influence of the use of E-Learning Platforms on students' Grades at Delta State Polytechnic, Otefe-Oghara.
2. To determine the nature of the relationship between Interactive Smartboards and Class Participation among students at Delta State Polytechnic, Otefe-Oghara.
3. To examine the relationship between the use of Educational Software and Assignment Completion Rates among students at Delta State Polytechnic, Otefe-Oghara.

Research Questions

1. How does the use of e-learning platforms influence student grades?
2. What is the relationship between interactive smartboard usage and class participation?
3. How does the use of educational software affect assignment completion rates?

Research Hypotheses

- **H_{o1}:** The use of e-learning platforms does not significantly impact students' grades.

- **H_{02}:** There is no significant relationship between interactive smartboard usage and class participation.
- **H_{03}:** There is no significant relationship between the use of educational software and assignment completion rates.

LITERATURE REVIEW

E-learning platforms are internet enabled platforms that support educational activities. These platform such as Google Classroom, Moodle, Blackboard and Zoom have re-engineered higher education by marrying asynchronous access with real-time collaboration, thereby sustaining learning even during shocks like COVID-19 (Alam et al., 2021; Franklin & Nahari, 2018; Means et al., 2013; Banjo, 2021). Empirical syntheses show consistent performance gains when students can revisit recorded lectures, discuss in forums and receive rapid feedback (Al-Fraihat et al., 2020; Schmid et al., 2014). Yet effectiveness is conditional: digital literacy, institutional support and infrastructure gaps moderate the relationship between usage and grades (Bowers & Kumar, 2015; Dhawan, 2020). In developing contexts, limited bandwidth, high data costs and device scarcity erode these benefits and widen attainment gaps (Nduka, 2018; Ogrutan & Aciu, 2020; Ogueli, 2023). Low-income students thus risk disengagement unless universities invest in subsidies, staff training and blended-learning strategies that maintain accountability and motivation (Cheung & Slavin, 2013; Umeh, 2021; Yakubu, 2020; Suresh et al., 2018; Türel & Johnson, 2018; Zolochevskaya et al., 2021).

Interactive smartboards extend digital transformation into the physical classroom by fusing touchscreen annotation, multimedia and instant polling to catalyse active learning (Türel & Johnson, 2018; Bowers & Kumar, 2015; Emmanuel, 2022). Across STEM and vocational courses they boost participation, visualise complex concepts and improve retention (Schmid et al., 2014; Suresh et al., 2018; Banjo, 2021). Positive engagement, however, is not automatic: lecturer competence with the technology, well-designed interactive tasks and reliable maintenance are critical (Umeh, 2021; Franklin & Nahari, 2018; Yakubu, 2020). High purchase and upkeep costs, patchy technical support and unequal classroom deployment limit diffusion, especially in resource-constrained polytechnics (Al-Fraihat et al., 2020; Means et al., 2013; Ogueli, 2023; Andreevich, 2020). Without institutional policies that budget for staff development and lifecycle replacement, smartboards risk becoming underused artefacts rather than engines of engagement (Cheung & Slavin, 2013; Dhawan, 2020).

Educational software ranging from Microsoft Office and MATLAB to SPSS, AutoCAD and AI tutoring systems—complements platforms and smartboards by streamlining assignment production and analytics (Franklin & Nahari, 2018; Alam et al., 2021; Emmanuel, 2022). Regular users show faster, more accurate task completion and stronger mastery of course outcomes thanks to automated feedback and self-paced practice (Banjo, 2021; Schmid et al., 2014; Suresh et al., 2018). Nevertheless, software efficacy is again moderated by access, licensing and training: high subscription fees, outdated hardware and weak connectivity curtail adoption, while skill gaps hinder sophisticated use (Dhawan, 2020; Al-Fraihat et al., 2020; Türel & Johnson, 2018). Studies in Nigerian polytechnics document students relying on pirated or feature-limited versions, which blunts potential gains (Ogrutan & Aciu, 2020; Ogueli, 2023; Zolochevskaya et al., 2021). Holistic digital-learning strategies must therefore pair procurement with capacity-building and equity safeguards to translate technology investments into measurable academic success (Umeh, 2021; Yakubu, 2020; Cheung & Slavin, 2013).

Theoretical Framework

This study was anchored o two theories – which include Constructivist Learning Theory (CLT) and Technology Acceptance Model (TAM). CLT positions students as active constructors of meaning who integrate new information with prior knowledge through exploration, collaboration and reflection (Mohammed & Kınyo 2020; Albert & Emery 2017). Digital tools sharpen this constructivist edge by surrounding learners with manipulable resources: interactive smartboards transform static lessons into tactile problem-spaces, while e-learning platforms Google Classroom or Zoom open peer-to-peer dialogue

beyond the classroom walls (Lascsakova 2024; Afify 2018). Recent evidence confirms that such technology-rich, learner-centred environments deepen engagement, higher-order thinking and retention (Farrelly et al. 2024; Jayasinghe 2024). At Delta State Polytechnic, for example, Joseph (2024) and Erhieyovwe (2022) report that constructivist-aligned activities digital annotations, shared whiteboards, AI-guided inquiry translate into measurable grade gains. Yet CLT's promise is moderated by access and motivation: where bandwidth is patchy, devices scarce or staff untrained, students struggle to enact self-directed learning (Ozokeraha & Omotegbona 2020; Obaro & Umusor 2021), underscoring the infrastructural prerequisites of a technology-mediated constructivist pedagogy.

TAM complements CLT by explaining why students embrace or resist the very tools that could facilitate active learning. Davis (1989) argues that adoption hinges on perceived usefulness (PU) and perceived ease of use (PEOU); subsequent extensions add attitude, social influence and behavioural intention (Hong et al. 2011; Salloum et al. 2019). Empirical tests across diverse contexts echo these determinants: students in Kathmandu displayed greater commitment to e-learning when platforms were intuitive and demonstrably beneficial (Bhattarai & Maharjan 2020), while Nigerian undergraduates' uptake rose when training and institutional support mitigated usability fears (Noh et al. 2021; Ofori 2019). TAM studies thus direct attention to external levers interface design, help-desk responsiveness, policy incentives that can shift perceptions and intentions. Nonetheless, critics note the model's limited sensitivity to structural barriers: affordability, connectivity and device ownership can veto adoption even when PU and PEOU are high (Joseph 2024; Ozokeraha & Omotegbona 2020).

Taken together, CLT and TAM provide a dual-lens framework for this desk-based review of e-learning platforms, interactive smartboards and educational software at Delta State Polytechnic, Otefe-Oghara. CLT clarifies how these tools should stimulate deeper learning through interactive tasks, collaborative knowledge-building and authentic problem-solving while TAM elucidates whether students perceive them as accessible and worthwhile, and therefore actually use them (Farrelly et al. 2024; Salloum et al. 2019). Integrating the two theories allows the study to interrogate both pedagogical effectiveness and adoption dynamics, revealing points where instructional design succeeds yet user acceptance falters. By mapping empirical findings onto this composite framework, the research can recommend holistic interventions upgraded infrastructure, targeted digital-literacy workshops, faculty development programmes that simultaneously nurture constructivist learning and improve technology acceptance, closing the performance gap highlighted in Nigerian tertiary education (Jayasinghe 2024; Noh et al. 2021).

METHODOLOGY

This investigation adopted a cross-sectional correlational design to map the statistical links between students' use of e-learning platforms, interactive smartboards and educational software and three performance proxies grades, classroom participation and assignment-completion rates. A total-population approach was taken: 400 under- and higher-national diploma students from Delta State Polytechnic were stratified first by programme (Science, Business, Engineering) and then by level (ND 1-2, HND 1-2); simple random selection within each stratum guaranteed equal selection probability and protected external validity (Noh et al., 2021; Ofori, 2019). This heterogeneous sampling frame is crucial because exposure to digital tools varies sharply by discipline engineering students, for example, routinely engage with simulation software yet the large N also strengthens statistical power for detecting moderate associations (Salloum et al., 2019; Hong et al., 2011). The non-experimental design fits the study aim detecting patterns rather than proving causality while avoiding ethical and logistical barriers associated with manipulating students' learning environments (Bhattarai & Maharjan, 2020).

Data were captured through an online questionnaire, adapted from validated digital-learning instruments and delivered via Google Forms for maximum reach. The tool combined five-point Likert items that gauged frequency of use, perceived effectiveness and engagement, with categorical questions on age, gender, level and faculty, plus self-reported grades, completion rates and participation scores. Three experts in test and measurement vetted the draft for content validity; a 20-student pilot yielded a

Cronbach's α of 0.78, confirming acceptable internal consistency (Bhattarai & Maharjan, 2020). Question wording was refined to curb response bias and ensure that constructs such as "engagement" and "ease of use" aligned with prior research definitions (Ofori, 2019). By triangulating frequency, perception and outcome data within one instrument, the study can disentangle usage intensity from satisfaction and relate both to academic success.

Descriptive statistics (mean, standard deviation, frequencies) profiled digital-tool uptake and performance trends, while Pearson's r tested the strength and direction of each bivariate relationship using SPSS and Python for robust computation and reproducibility (Salloum et al., 2019; Noh et al., 2021). Ethical safeguards paralleled methodological rigour: institutional clearance preceded data collection; informed consent outlined voluntary participation and the right to withdraw; anonymity was preserved by omitting personally identifying data and encrypting files on password-restricted drives (Hong et al., 2011). Only the principal investigators accessed raw datasets, and results will be reported in aggregate to prevent inadvertent disclosure. These procedures uphold the autonomy, beneficence and justice principles that underpin educational research ethics while ensuring that the resulting evidence on digital-learning effectiveness is both trustworthy and policy-relevant.

RESULTS

Table 1: demographic features of the respondents

Category (N=335)	Groups	F	%
Gender	Female	232	69.3
	Male	103	30.7
Age Group	16–20 years	75	22.4
	21–25 years	224	66.9
	26–30 years	33	9.9
	31 years and above	3	0.9
Level of Study	HND2	61	18.2
	ND1	2	0.6
	ND2	272	81.2
Program of Study	Business	283	84.5
	Science	52	15.5

The demographic analysis of the study participants at Delta State Polytechnic, Otefe-Oghara (Table 1) reveals key trends in gender, age, level of study, and program enrollment. The sample consists predominantly of female students (69.3%), with males making up 30.7%, indicating a higher female representation. Most students fall within the 21–25 years age group (66.9%), followed by 16–20 years (22.4%), while older age groups are less represented (26–30 years: 9.9%; 31 years and above: 0.9%). In terms of academic level, the majority are in ND2 (81.2%), with HND2 (18.2%) and ND1 (0.6%) making up the rest. Regarding the program of study, Business students dominate (84.5%), while Science students account for 15.5%. These findings suggest that most respondents are young, business-focused students in their final ND stage, which may influence their engagement with digital learning tools and academic performance outcomes.

Table 2: An Analysis of the Pearson Product-Moment Correlation **to examine the relationship between the use of e-learning platforms and students' grades at Delta State Polytechnic, Otefe-Oghara.**

Variables	N	df	R	P (Sig.)	Decision
Use of E-Learning Platforms	335	333	0.562	0.014	Rejected H_{01} (Significant)
Students' Grades	335	333			

(Significant) P < 0.05

The correlation analysis between e-learning platform usage and students' grades in table 2 above indicated a moderate positive relationship (R = 0.562, p = 0.014). This suggests that students who frequently use e-learning platforms, such as Google Classroom and Zoom, tend to achieve higher academic scores. The statistically significant p-value ($p < 0.05$) confirms that the relationship is unlikely due to chance. This finding aligns with previous research that highlights the role of digital learning in improving knowledge retention and performance. Therefore, integrating e-learning tools effectively can enhance students' academic success at Delta State Polytechnic, Otefe-Oghara.

Table 3: An Analysis of the Pearson Product-Moment Correlation to assesses the relationship between interactive smartboard usage and class participation among students at Delta State Polytechnic, Otefe-Oghara.

Variables	N	df	R	P (Sig.)	Decision
Interactive Smartboard Usage	335	333	0.648	0.009	Rejected H_{02} (Significant)
Class Participation	335	333			

(Significant) P < 0.05

The correlation between interactive smartboard usage and class participation (Table 3) revealed a strong positive relationship (R = 0.648, p = 0.009). This suggests that students in classes where interactive smartboards are used actively participate more frequently in discussions and learning activities. The significant p-value ($p < 0.05$) confirms that this association is statistically meaningful. Smartboards enable visual engagement, real-time interaction, and multimedia learning, which foster higher participation rates. These findings suggest that expanding the use of interactive smartboards in classrooms could enhance student engagement and encourage more collaborative and interactive learning at Delta State Polytechnic, Otefe-Oghara.

Table 4: An Analysis of the Pearson Product-Moment Correlation to examines the relationship between the use of educational software and assignment completion rates at Delta State Polytechnic, Otefe-Oghara

Variables	N	df	R	P (Sig.)	Decision
Use of Educational Software	335	333	0.591	0.012	Rejected H_{03} (Significant)
Assignment Completion Rates	335	333			

(Significant) P < 0.05

The correlation analysis between the use of educational software and assignment completion rates reveals a moderate positive relationship (R = 0.591, p = 0.012). This suggests that students who regularly use educational software, such as Microsoft Office, SPSS, and programming tools, are more likely to complete their assignments on time. The significant p-value ($p < 0.05$) indicates that this relationship is not due to random variation. This finding emphasizes the importance of integrating technology-driven learning resources to enhance students' productivity and time management. Providing access to quality educational software can improve assignment completion rates at Delta State Polytechnic, Otefe-Oghara.

DISCUSSION

This study revealed clear statistical gains when digital tools are embedded in teaching. Frequent use of e-learning platforms such as Google Classroom and Zoom correlates moderately with higher course grades (R = 0.562, p = 0.014), while interactive smartboards are strongly linked to richer classroom participation (R = 0.648, p = 0.009). Likewise, regular engagement with educational software from Microsoft Office to SPSS aligns with timely assignment completion (R = 0.591, p = 0.012). Together these coefficients

indicate that virtual learning spaces, visually dynamic lessons and productivity tools act on different but complementary facets of performance: cognitive achievement, in-class engagement and task management. In practical terms, the results suggest that students who combine asynchronous access to content with interactive visualisation and guided software practice can translate digital exposure into measurable academic benefits.

These positive patterns echo a broad empirical literature. Studies grounded in constructivist pedagogy report higher engagement and deeper retention when digital tools support active exploration (Farrelly et al., 2024; Jayasinghe, 2024); meta-analytic work likewise links smartboard use to fuller participation (Schmid et al., 2014) and software to faster, more accurate assignment production (Suresh et al., 2018). Al-Fraihat et al. (2020) add that platform usage boosts grades via self-paced review and on-demand feedback, mirroring the present grade correlation. Yet other investigations temper this optimism: Dhawan (2020) warns that flexibility alone cannot overcome low motivation or poor digital literacy; Means et al. (2013) find that technology effects dissipate without strong pedagogy; Cheung and Slavin (2013) report only marginal gains unless tools are woven into coherent instructional designs; and Ogueli (2023) documents how bandwidth constraints in Nigerian universities blunt potential benefits. Such divergence highlights the contingency of digital impact on infrastructure quality, staff expertise and student readiness.

Theoretically, the findings dovetail with Constructivist Learning Theory, which argues that knowledge construction thrives on interactive, student-controlled experiences exactly the affordances of smartboards and collaborative platforms (Mohammed & Kınyo, 2020; Lascsakova, 2024). Simultaneously, the strong adoption evident in the sample supports the Technology Acceptance Model proposition that perceived usefulness and ease of use drive technology uptake and, in turn, outcomes (Bhattarai & Maharjan, 2020; Noh et al., 2021). Practically, administrators should therefore scale bandwidth, license key software and expand cloud access to reinforce perceived usefulness, while investing in lecturer training to boost ease of use. Incorporating smartboard-based problem-solving sessions, curating platform-hosted discussion forums and embedding software-driven assignments can translate the observed correlations into causally robust gains. Policymakers must also tackle structural barriers device affordability, campus Wi-Fi, digital-literacy workshops to ensure that the demonstrated promise of digital learning tools transforms into equitable and sustained improvements in academic success.

CONCLUSION

This study examined the impact of digital learning tools on student performance at Delta State Polytechnic, Otefe-Oghara. The findings revealed that e-learning platforms contribute positively to student grades, indicating that students who frequently engage with platforms such as Google Classroom and Zoom tend to achieve better academic outcomes. Additionally, there is a strong link between interactive smartboard usage and class participation, demonstrating that students in technology-enabled classrooms are more engaged and actively involved in discussions. Furthermore, the use of educational software enhances assignment completion rates, suggesting that students who utilize tools like Microsoft Office, SPSS, and programming applications are more likely to complete their coursework on time. These findings confirm that digital learning tools play a vital role in improving academic success by fostering engagement, participation, and productivity. However, challenges such as accessibility, infrastructure limitations, and digital literacy gaps must be addressed to ensure students fully benefit from technology-enhanced learning.

RECOMMENDATIONS

In agreement with the findings and conclusions of this study, the following recommendations were made:

1. Educational institutions and policymakers should increase investment in e-learning platforms and interactive smartboards to enhance student engagement and improve learning outcomes. Expanding access to digital learning tools will create more interactive and dynamic learning environments.

2. University administrators and government agencies should work towards improving access to educational software by providing licensed versions of essential academic programs. This can be achieved through institutional subscriptions, ensuring affordability for all students.
3. Faculty development teams and academic institutions should implement targeted training programs to equip instructors with the necessary skills to integrate digital tools effectively into their teaching methods.
4. Technology departments and institutional IT support teams should focus on improving digital infrastructure by expanding internet connectivity and providing ongoing technical support to ensure the seamless adoption and utilization of learning technologies.

Suggestions for Future Research

Based on the study scope and limitations, it was suggested that future interested researcher should:

1. Extend the study to other polytechnics for comparative analysis: Conducting similar research across multiple institutions will help determine whether digital learning trends are consistent across different educational settings.
2. Investigate the role of digital literacy in optimizing e-learning outcomes: Future research should explore how students' proficiency in digital tools influences their academic performance and engagement levels.

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