EDUCATIONAL TECHNOLOGY AND LEARNING EFFECTIVENESS AMONG UNDERGRADUATES OF ADEYEMI FEDERAL UNIVERSITY OF EDUCATION, ONDO

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Abstract
This study examined the relationship between educational technology and learning effectiveness. Specifically, it found out the availability and utilization of educational technology among undergraduates of Adeyemi Federal University of Education, Ondo and its influence on their learning effectiveness. The research employed a descriptive survey design. Samples of 300 undergraduates were randomly selected as respondents, from five faculties in the institution. Structured questionnaire with Cronbach's alpha of 0.87 was used to collect data from the respondents. Data gathered were analysed using descriptive and inferential statistics. Findings revealed a high level of both availability and utilization of various educational applications, including Learning Management Systems, collaborative tools, and productivity apps. Crucially, the study established a significant positive relationship between the utilization of these applications and students' perceived learning effectiveness. Students reported enhanced understanding of concepts, improved critical thinking, increased engagement, better information retention, and overall academic improvement through effective application use. The study therefore recommends continued investment in digital infrastructure and strategic pedagogical integration of these tools to optimize student learning and prepare future educators for a digitally-driven world.

Keywords: Educational Applications, Technology, Learning Effectiveness

Introduction

The 21st century has witnessed an unprecedented digital transformation, profoundly impacting every sector, not least education. This global shift accelerated by technological advancements and evolving societal demands, has redefined learning environments, pedagogical approaches, and the very essence of educational delivery (Kumar & Nanda, 2019). Traditional classroom models are increasingly being augmented, and sometimes supplanted, by digital tools and platforms designed to enhance accessibility, engagement, and personalization in learning. At the forefront of this revolution is educational technology (EdTech), a broad field encompassing various digital tools and resources aimed at improving teaching and learning processes (Bates, 2019). Within the vast expanse of EdTech, educational applications – software programs specifically designed for learning purposes and accessible across various devices – have emerged as particularly influential, promising to redefine the boundaries of knowledge acquisition and skill development. This study delves into the intricate relationship between these educational applications and learning effectiveness among students at Adeyemi Federal University of Education, Ondo, a critical institution poised to shape the future of Nigeria's educational landscape.

The concept of educational technology has evolved dramatically over the past decade, moving beyond mere digital aids to sophisticated ecosystems that facilitate dynamic, interactive, and adaptive learning experiences. Initially, EdTech largely focused on rudimentary computer-assisted instruction (CAI) and basic e-learning platforms. However, the period between 2015 and 2025 has seen an explosion in the sophistication and ubiquity of these tools, driven by advancements in artificial intelligence (AI), machine learning, cloud computing, and mobile technology (Zawacki-Richter & Naidu, 2016). Educational applications as a specific subset of EdTech, represent a highly accessible and versatile segment of this technological evolution. These applications range from comprehensive Learning Management System (LMS) apps that centralize course content, assignments, and communication (Moodle Mobile, Canvas Student) to specialized tools designed for specific learning tasks. Examples include interactive simulation apps for science and engineering, gamified language learning applications (Duolingo, Babbel), collaborative document editing tools (Google Workspace for Education), and adaptive assessment platforms that provide immediate, personalized feedback (Johnson, Adams-Becker, Cummins, Estrada, Freemas & Hall, 2020).

The proliferation of smartphones and tablets has made these applications readily available to students, transforming personal devices into powerful learning instruments (Pew Research Center, 2019). The promise of educational applications lies in their potential to offer personalized learning pathways tailored to individual student needs and paces, increase student engagement through interactive and multimedia content, provide immediate feedback that supports formative assessment, facilitate collaborative learning among peers, and extend learning beyond the traditional classroom walls, thus promoting lifelong learning skills (Huang, Spector & Zou, 2021; UNESCO, 2021). Despite these immense potentials, challenges persist, including ensuring equitable access, managing digital distractions, fostering digital literacy among both educators and learners, and guaranteeing the quality and pedagogical soundness of the applications themselves (Adetayo & Adebayo, 2017). The rapid innovation in this space means that understanding the actual impact of these applications on learning remains a continuous area of inquiry.

In the context of higher education, learning effectiveness is a construct that extends beyond mere rote memorization or exam scores. It encompasses a holistic development that includes academic achievement (grades, successful completion of courses), the acquisition of specific knowledge and skills (both theoretical and practical), retention of information over time, the development of higher-order thinking skills such as critical thinking, problem-solving, and analytical reasoning, as well as crucial non-cognitive outcomes like motivation, engagement, self-regulation, and collaborative abilities (Hattie & Timperley, 2017; Means, Bakia & Murphy, 2019). The theoretical underpinnings for how educational applications might enhance learning effectiveness are diverse. Cognitive load theory emphasizes that well-designed applications can optimize the presentation of information, reducing extraneous cognitive load and focusing on germane load, thereby improving comprehension and retention (Sweller, 2020).

Furthermore, engagement theories propose that interactive, gamified, and multimedia-rich applications can significantly boost student motivation and sustained participation, leading to better learning outcomes (Shernoff, Csikzentmihalyi, Schineider & Shernoff,

2016). Studies have shown varied impacts of technology on learning effectiveness. While some research points to significant gains in achievement and motivation through personalized adaptive learning systems (Kizilcec, Reich, Yeomans, Dann & Brunskill, 2020) and interactive simulations (Wouters, Van-Nimwegan, Van-Oostendorp & Van-der-Spek, 2017), others highlight that technology's effectiveness is often mediated by pedagogical design, teacher training, and student readiness (UNESCO, 2023). For instance, an application might offer powerful features, but if instructors are not trained to integrate it effectively into their teaching, its potential to enhance learning effectiveness may not be fully realized. Therefore, understanding learning effectiveness in this study involves exploring not just academic outcomes but also student engagement, satisfaction, and the perceived utility of educational applications.

Nigeria as a developing nation with a large youth population has increasingly recognized the importance of technology in education to address challenges such as access, quality, and relevance. The National Policy on Education in Nigeria periodically reviewed explicitly emphasizes the integration of ICT into all levels of education (Federal Republic of Nigeria, 2013). However, the actual implementation of EdTech in Nigerian higher education institutions has faced significant hurdles. These challenges typically may include inadequate infrastructure (unreliable internet connectivity, erratic power supply), limited funding for technological upgrades, a scarcity of digitally literate educators, and a digital divide that restricts equitable access to devices and internet for many students, particularly those from rural or low-income backgrounds (Okonkwo & Nwoga, 2018; Uchegbu & Okoro, 2020).

It appears that despite these obstacles, many Nigerian universities including federal institutions have made concerted efforts to integrate e-learning platforms and encourage the use of educational applications, especially amplified by the disruptions caused by the COVID-19 pandemic which necessitated remote learning (Adebayo & Olusanya, 2021). Academic scholars from Nigeria have actively investigated various aspects of EdTech adoption. For example, research has explored the challenges faced by students in accessing online learning resources (Iji & Ukwayi, 2019), the attitudes of lecturers towards using technology in teaching (Alabi & Adigun, 2018), and the perceived benefits and barriers to blended learning approaches (Oladapo & Olakulehin, 2022). These studies paint a picture of a sector grappling with both the immense potential of EdTech and the practical realities of infrastructure and capacity constraints.

This study aims to bridge a critical gap in localized knowledge. While global trends and national policies advocate for the widespread adoption of EdTech, and educational applications specifically, there is a distinct need to understand their real-world impact on learning effectiveness within specific institutional contexts like Adeyemi Federal University of Education, Ondo. Previous research has broadly touched on EdTech in Nigeria, but a focused examination on educational applications and their direct correlation with various dimensions of learning effectiveness among future educators in a federal university of education remains under-explored.

Purpose of the Study

The broad objective of the study is to examine the relationship between educational technology and learning effectiveness among undergraduates of Adeyemi Federal University of Education, Ondo. Specifically, this study seeks to determine the relationship between

utilization of educational applications and learning effectiveness among students.

Research Questions

The following research questions were raised to guide this study:

1. What is the level of availability of educational applications among?
2. What is the level of utilization of educational applications among students?
3. What is the level of learning effectiveness of students?

Research Hypothesis

One research hypothesis was formulated in this study;

HO_1: There is no significant relationship between utilization of educational applications and learning effectiveness among undergraduates of Adeyemi Federal University of Education, Ondo.

Methods

This study employed a descriptive survey research design. This design was chosen for its appropriateness in gathering information about the current state of phenomena and describing existing relationships between variables without manipulation. The population of the study comprised all undergraduates of Adeyemi Federal University of Education, Ondo. A sample of 300 undergraduates was drawn from across five faculties within the institution. A multi-stage sampling procedure was utilized to select the participants. First, simple random sampling technique was employed to select five (5) faculties in the university; next, random sampling technique was also used to select sixty (60) respondents from each of faculty.

This instrument was developed by the researchers based on the research objectives; it was designed to gather data on students' availability and utilization of various educational applications, and their learning effectiveness in relation to these applications. The questionnaire utilized a four Likert-type scale to capture the extent of agreement or disagreement with various statements.

The reliability of the research instrument was established using Cronbach's Alpha coefficient. A pilot study was conducted with a small group of students from a similar population but not included in the main study. The calculated Cronbach's Alpha coefficient for the instrument was 0.87. This value indicates a high level of internal consistency and reliability, suggesting that the instrument consistently measures what it intends to measure.

The collected data were analysed using descriptive and inferential statistics. Frequency counts and percentages were used to summarize demographic information of the respondents, frequency counts and mean scores were calculated to determine the average responses to items to answer the research questions, while Pearson Product Moment Correlation coefficient was used to test for the null hypothesis at 0.05 level of significance.

Results

Table 1: Demographic Information of the Respondents

Variables		Frequency	Percentage
Gender	Male	98	32.7
	Female	202	67.3
Faculties	Education	60	20.0
	Science	60	20.0
	Arts	60	20.0
	Social Sciences	60	20.0
	Vocational	60	20.0

Table 1 reveals that 32.7% (98) of the respondents were male while 67.3% (202) of them were female. This infers that, majority of the respondents were female. The table also revealed that 20.0% (60) of the respondents were selected from each of the five faculties. This infers that the respondents were evenly distributed across the five faculties in Adeyemi Federal University of Education, Ondo.

Answers to Research Questions

Research Question 1: What is the level of availability of educational applications among students?

Table 3: Descriptive Statistics on the Level of Availability of Educational Applications among Students

S/N	Items	SA	A	D	SD	Mean	Remarks
1	I have easy access to Google Classroom.	138	144	6	12	3.36	Agreed
2	The University makes available Learning Management System to the students.	120	144	24	12	3.24	Agreed
3	Collaborative educational apps such as Google Meet and Zoom are available for the students.	174	87	24	15	3.40	Agreed
4	There is availability of productivity apps such as Microsoft Word for the students.	135	117	33	15	3.24	Agreed
5	Online dictionaries and academic search engines are readily available for the students.	225	75	0	0	3.75	Agreed
	Weighted Average					**3.40**	

Decision Rule: 0 – 2.49 = low, 2.50 – 4.00 = high

Table 3 shows that majority of the respondents agreed that; they have easy access to Google Classroom (mean = 3.36), the University makes available Learning Management System to the students (mean = 3.24), collaborative educational apps such as Google Meet and Zoom are available for the students (mean = 3.40), there is availability of productivity apps such as Microsoft Word for the students (mean = 3.24), online dictionaries and academic search engines are readily available for the students (mean = 3.75). Meanwhile, based on the value of the weighted average (3.40 out of 4.00 maximum value that can be obtained), which falls within the decision value for high, it can be inferred that, there is high level of availability of educational applications among students in Adeyemi Federal University of Education, Ondo.

Research Question 2: What is the level of utilization of educational applications among students?

Table 4: Descriptive Analysis on the Level of Utilization of Educational Applications among Students

S/N	Items	SA	A	D	SD	Mean	Remarks
1	I frequently use Google Classroom for assignments.	123	171	3	3	3.38	Agreed
2	I make use of the University's Learning Management System for accessing course contents.	177	96	15	12	3.46	Agreed
3	I often use collaborative educational apps such as Google Meet and Zoom are available for group discussions.	141	144	15	0	3.42	Agreed
4	I spend a considerable time each week on productivity apps such as Microsoft Word for organizing notes and completing assignments.	225	75	0	0	3.75	Agreed
5	Online dictionaries and academic search engines are integral part of my daily study routine.	75	111	81	33	2.76	Agreed
	Weighted Average					**3.35**	

Decision Rule: 0 – 2.49 = low, 2.50 – 4.00 = high

Table 4 reveals that majority of the respondents agreed that; they frequently use Google Classroom for assignments (mean = 3.38), they make use of the University's Learning Management System for accessing course contents (mean = 3.46), they often use collaborative educational apps such as Google Meet and Zoom for group discussions (mean = 3.42), they spend a considerable time each week on productivity apps such as Microsoft Word for organizing notes and completing assignments (mean = 3.75), online dictionaries and academic search engines are integral part of their daily study routine (mean = 2.76). Meanwhile, based on the value of the weighted average (3.35 out of 4.00 maximum value that can be obtained), which falls within the decision value for high, it can be inferred that, there is high level of utilization of educational applications among students in Adeyemi Federal University of Education, Ondo.

Research Question 3: What is the level of learning effectiveness among students?

Table 5: Descriptive Statistics on the Level of Learning Effectiveness among Students

S/N	Items	SA	A	D	SD	Mean	Remarks
1	Using educational applications helps me understand course concepts more effectively.	72	156	60	12	2.96	Agreed
2	Educational applications improve my ability to critically analyse information and solve problems.	90	96	96	24	2.88	Agreed
3	I feel more engaged and motivated in my learning when I use educational applications.	96	93	90	21	2.88	Agreed
4	Educational applications help me retain information better and prepare for assessments more effectively than traditional methods.	30	132	105	36	2.54	Agreed
5	My overall academic performance and grades in courses significantly improve when I effectively use educational applications.	72	120	96	12	2.84	Agreed
	Weighted Average					**2.82**	

Decision Rule: 0 – 2.49 = low, 2.50 – 4.00 = high

Table 5 shows that majority of the respondents agreed that; using educational applications helps me understand course concepts more effectively (mean = 2.96), educational applications improve my ability to critically analyse information and solve problems (mean = 2.88), they feel more engaged and motivated in my learning when I use educational applications (mean = 2.88), educational applications help students retain information better and prepare for assessments more effectively than traditional methods (mean = 2.54), their overall academic performance and grades in courses significantly improve when I effectively use educational applications (mean = 2.84). Meanwhile, based on the value of the weighted average (2.82 out of 4.00 maximum value that can be obtained), which falls within the decision value for high, it can be inferred that, there is high level of learning effectiveness of students in Adeyemi Federal University of Education, Ondo.

Hypothesis Testing

HO_1: There is no significant relationship between utilization of educational applications and learning effectiveness among students in Adeyemi Federal University of Education, Ondo.

Table 6: Pearsons' Product Moment Correlation Coefficient on the Relationship between Utilization of Educational Applications and Learning Effectiveness among Students

		Utilization of educational apps	Learning effectiveness
Utilization of educational apps	Pearson Correlation		.792**
	Sig. (2-tailed)		.000
	N		300
Learning effectiveness	Pearson Correlation	.792**	
	Sig. (2-tailed)	.000	
	N	300	

Table 6 shows that, there is a significant relationship between utilization of educational applications and learning effectiveness among students in Adeyemi Federal University of Education, Ondo ($r = 0.792$, $N = 300$, sig. $= 0.000$, $p < 0.05$). Hence, the more the use of educational applications among students, the more the effectiveness of learning.

Discussion

The study's findings revealed a high level of availability of educational applications among students at Adeyemi Federal University of Education, Ondo. Students largely perceive easy access to a range of relevant digital tools, including specific learning platforms like Google Classroom and the university's Learning Management System, collaborative applications such as Google Meet and Zoom, and productivity apps like Microsoft Word. Furthermore, online dictionaries and academic search engines are readily accessible, contributing to this overall high availability. This finding aligns with the empirical evidences from Pew Research Center (2019), Huang et al. (2021), Adebayo and Olusanya (2021), and UNESCO (2021) that the global proliferation of smartphones and tablets has significantly transformed personal devices into powerful learning instruments, making educational applications more readily accessible to students than ever before.

The study's findings indicate a high level of utilization of educational applications among students at Adeyemi

Federal University of Education, Ondo. Students frequently integrate various digital tools into their academic routines. This includes regular use of platforms like Google Classroom for assignments and the University's Learning Management System for accessing course content. Furthermore, collaborative educational applications such as Google Meet and Zoom are commonly employed for group discussions, and a considerable amount of time is dedicated weekly to productivity apps like Microsoft Word for organizing notes and completing assignments. Online dictionaries and academic search engines are also perceived as an integral part of their daily study routine. This high level of utilization aligns with the studies of Adebayo and Olusanya (2021), UNESCO (2021), Iji and Ukwayi (2019), Pew Research Center (2019), and Uchegbu and Okoro (2020) on the escalating trend of digital technology integration in higher education globally, especially following the disruptions caused by the COVID-19 pandemic. The pandemic compelled a rapid shift towards online and blended learning, necessitating widespread adoption and active use of various educational applications by both institutions and students.

The study's findings also revealed that students of Adeyemi Federal University of Education, Ondo, perceive a high level of learning effectiveness attributed to their use of educational applications. Respondents largely agree that these applications significantly aid their understanding of course concepts, enhance their ability to critically analyze information and solve problems, increase their engagement and motivation in learning, help them retain information more effectively for assessments, and ultimately contribute to an improvement in their overall academic performance and grades. This collective perception points to educational applications being a valuable tool for enhancing the learning experience. This finding is in alignment with the studies of Kizilcec et al. (2020), Sweller (2020), Shernoff et al (2016), and Adebayo and Olusanya (2021). The findings underscore that when students effectively integrate a diverse suite of applications into their study routines, encompassing everything from concept understanding to critical thinking and preparation for assessments, their academic journey is significantly enhanced. This supports the notion that educational applications, when properly leveraged, are becoming central to contemporary student learning effectiveness.

The study's findings reveal a significant positive relationship between the utilization of educational applications and learning effectiveness among students at Adeyemi Federal University of Education, Ondo. This indicates that as students increase their use of educational applications, their learning effectiveness also tends to improve. This strong correlation underscores the practical benefits students derive from integrating these digital tools into their academic practices. This finding aligns robustly with the studies of Huang et al. (2021), UNESCO (2021), Kizilcec et al. (2020), Okonkwo and Nwoga (2018), Uchegbu and Okoro (2020), and Adebayo and Olusanya (2021).

Conclusion

This study concluded that there is a high level of availability and utilization of educational applications among students of Adeyemi Federal University of Education, Ondo. Crucially, the findings revealed a significant positive relationship between the utilization of these applications and students' learning effectiveness. This indicates that effective engagement with educational applications directly contributes to improved understanding, critical thinking, engagement, information retention, and overall academic performance.

Recommendations

As a result of the findings of this study, the following recommendations were made:

1. The university administration should continue to invest in robust digital infrastructure and ensure consistent access to a wide array of relevant educational applications.
2. Lecturers should be encouraged and trained to integrate educational applications purposefully into their teaching methods to maximize student engagement and active learning.
3. The university authority should emphasize training for faculties on how to pedagogically leverage applications to foster critical thinking and deeper understanding, beyond basic content delivery.
4. The university should regularly assess the effectiveness of specific educational applications and collect feedback from students to ensure their continued relevance and impact on learning outcomes.

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