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Multimedia Technology as a Catalyst for E-Learning and Remote Education in Ogun State, Nigeria

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Abstract

E-learning platforms powered by multimedia technology provide flexibility and convenience for both students and educators. The present study investigates the role of multimedia technology in facilitating e-learning and remote education initiatives in Ogun State, Nigeria. The population of this study are students and higher institutions that are operating e-learning and remote education in Ogun State. The study used a survey research design in which a questionnaire was used as a research instrument for data collection. The systematic sampling method was used in this study. A total number of 120 students were administered a questionnaire. The data analysis was carried out using SPSS version 25.0 software. The findings of the study revealed that Multimedia technology facilitates the integration of real-world examples, case studies, and multimedia resources into the curriculum bringing about practical application (X = 2.98, SD = 1.27) Poor and unreliable internet connectivity can be a significant barrier in utilizing multimedia technology (X = 3.84, SD =1.87). Further findings revealed that multimedia technology (YouTube, Zoom, Podcast, Facebook, and Google Classroom) significantly impacted e-learning [(R^2 = .814; F (5, 119) = 396.235; p < .05)] jointly accounted for about 81.4% of the variance observable in e-learning. The independent contributions of Zoom, Facebook, YouTube, and Google Classroom were significant while that of podcast was not statistically significant. The study recommends the need to invest in infrastructure development to improve access to reliable internet connectivity and electricity in both urban and rural areas of Ogun State

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Introduction

Multimedia technology enables educators to create and distribute high-quality educational content in various formats such as videos, animations, interactive simulations, and virtual reality experiences. Multimedia technology plays a crucial role in facilitating e-learning and remote education initiatives in Nigeria. For both students and teachers' multimedia-powered e-learning platforms offer flexibility and convenience. Anywhere they have a compatible device and an internet connection students can access educational resources at any time. In Nigeria where access to educational resources may be restricted or not accessible in some areas this is especially advantageous. Students levels of engagement are raised by multimedia components like movies graphics and interactive tests which improves the effectiveness and enjoyment of learning. This may result in enhanced academic performance and better information retention. With the use of multimedia technologies educators can tailor lessons to the individual needs and interests of every student. Adaptive learning algorithms based on virtual seminars can produce personalized recommendations for further study allowing teachers to stay up to date with new technologies and enhance their methods of instruction. The growing interest in education and personal development among individuals and institutions has led to a surge in lifelong learning. These days people need to improve their knowledge and skills to stay current (Dubé et al.

2017). An analysis of students performance is incorporated into computer-based learning or e-learning which can help close knowledge gaps and improve learning outcomes. Multimedia technologies can be used to provide training and professional development opportunities for Nigerian teachers. Teachers can enhance their teaching methods and stay up to date with new technologies by using webinars online courses and virtual seminars. Institutions and individuals' increasing interest in education and personal development has led to a boom in lifelong learning.

Nowadays, to stay up-to-date people, upgrade their knowledge and abilities (Dubé et al., 2017). E-learning is a computer-based learning process that incorporates digital content, system-based administrations, and mentoring support and facilitates communication between students and teachers, according to Arghya et al. (2020). Projectors, operating systems, iPads, and digital movies are a few examples of this kind of learning.

As e-learning platforms proliferate, more research papers and materials are being produced to address students' educational demands (Franco and Garcia, 2018). E-learning is becoming more popular in a variety of fields. Students in higher education use e-learning as a tool to study logically whenever and wherever they are (Nuryyev et al., 2020). E-learning facilitates the creation and development of human capacities. For example, if instructors and pupils in private educational institutions are better equipped to offer lectures utilizing e-learning resources, they will become more inventive (Agostini & Nosella, 2020). Furthermore, the transition from traditional classroom learning to e-learning represents a significant shift in both the learning model and educational institutions. This leads to innovative behavior and attitudes. Furthermore, some important innovation capabilities are necessary to ensure successful e-learning implementation (Hong et al., 2018).

There is a digital divide with disparities in access to technology and digital literacy skills among students and educators. Computers smartphones and other gadgets required to engage in multimedia-enhanced e-learning activities might not be within the reach of many students. Sometimes, teachers lack the education and expertise needed to successfully incorporate multimedia technology into their lesson plans while multimedia educational materials that are pertinent to the local context might not be widely available in Ogun State. Further, the regions cultural and linguistic diversity may not be sufficiently addressed by the e-learning platforms and resources currently in use which would deprive students of engagement and relevance. The acceptance and uptake of multimedia-enhanced e-learning initiatives in Ogun State may be influenced by sociocultural factors such as attitudes toward technology and conventional teaching methods. Long-term success depends on removing cultural barriers and building community support for technology-enabled education. Thus, this study explores how multimedia technology supports e-learning and remote education initiatives in Ogun State, Nigeria.

The primary aim of this study is to investigate the role of multimedia technology in facilitating e-learning and remote education initiatives in Ogun State, Nigeria. The specific objectives include, To identify the types of multimedia technologies used in e-learning and remote education initiatives in Ogun State. To assess the effectiveness of multimedia technology in improving student engagement and learning outcomes in e-learning and remote education initiatives. To examine the challenges of using multimedia technology in facilitating e-learning and remote education initiatives in Ogun State, Nigeria.

H_0: There is no significant impact of multimedia technology on e-learning

According to Eze et al. (2018), e-learning is defined as technology-enabled and digitally approved learning tools that use digital cameras, PCs, tablets, digital videos, projectors, and operating systems to allow student-teacher interaction. It also encompasses a variety of PC applications that support both in-person and remote learning. From traditional learning, e-learning has developed into a modern, customized, adaptive, and synergistic method of instruction that involves instructors, facilitators, and learners (Falana, 2015). Conventional education was believed to be teacher-centric, whereas learner-focused learning is focused on technology that allows learners to spread and access knowledge frequently. E-learning covers basic and synergistic PC-supported scholarship procedures as well as evaluation methods that use innovative approaches and apps to boost teaching and research. It also allows teachers and students to exchange learning materials prepared in a uniform manner (Eze et al., 2018).

Every institution should incorporate e-learning as a crucial tactic into their current teaching and learning methods for community-focused learning as well as for the students (Falana, 2015).

Multimedia technology encompasses a wide range of tools and platforms that integrate various forms of media such as text, audio, video, graphics, and animations. It refers to the integration of multiple forms of media to convey information, entertain, or communicate effectively. This includes digital media such as images, audio, video, animations, and interactive content. Multimedia technology is used for creating engaging advertisements, promotional videos, interactive websites, and social media campaigns.

i. Web-based Multimedia: Multimedia content delivered over the internet, including websites, online videos, streaming media, web applications, and social media platforms. Examples include Facebook, Twitter, Youtube, Zoom etc
ii. Mobile Multimedia: Multimedia content designed for mobile devices like smartphones and tablets. This includes mobile apps, mobile websites, mobile games, and multimedia messaging services.
iii. Interactive Multimedia: Allows users to actively engage with the content, often through interfaces like buttons, menus, sliders, or touchscreens. Interactive multimedia can include games, simulations, educational software, and interactive websites.

In their 2017 study, Nwokolo et al. examined the effects of e-learning on instruction and training in public tertiary education institutions in Nigeria. They also talked about the factors that prevent e-learning from being fully adopted, such as a lack of technical manpower, power shortages, and the high cost of computer hardware acquisition. The study suggested a course of action and discussed the possibility of its complete implementation within the institutions. Both the federal and state governments of Nigeria should invest in ICT worker training and infrastructure they recommended. They also emphasized that colleges should invest in faculty renewable and alternative energy sources and cloud-based learning resources for continuous accessibility.

In a study published in 2023 Banjo and Yinus investigated how ICT use in technical and vocational education training could facilitate remote flexible and open learning in Nigeria. ICT use promotes collaboration and communication between teachers and students per the studys findings (X = 3. 74 SD = 1. 06). Additionally, it enables students to access thousands of classes on a variety of subjects and courses whenever wherever and however convenient they need them. (X=3. 57 SD=1. 16). Additionally, the hypothesis's outcome showed that ICT greatly encourages flexible and open-ended learning in Nigeria ($r = 0.68$, $p<.05$).

Aboderin (2019) investigated the challenges and opportunities of e-learning for creating and executing curricula in Nigeria's Ondo State secondary schools. The research concentrated on the tactics and potential of e-learning in secondary schools, as well as the accessibility of e-learning tools in executing curriculum and the extent to which teachers use them. The results showed that there are not enough e-learning tools available, and those that are are not being used to their full potential. According to the researchers, the government should arrange for instructors to receive ongoing training and retraining on how to use the facilities, and teachers should then routinely use them with students during class and research activities

Materials and Methods

In this study, a survey research design was used. The population is focused on students and higher institutions that are operating e-learning and remote education in Ogun State. In Ogun State, there are eleven private Universities, four private Polytechnics, and two private Colleges of Education. Only one university was selected for this study and a sample size of 120 students was selected using systematic sampling. The research instruments used were questionnaires. Data was analyzed using SPSS version 25.0 to analyze data collected using the questionnaires. The research questions were answered and analyzed using frequency tables and a pie chart while the hypothesis was analyzed using Multiple Regression Analysis.

What are the types of multimedia technologies being used in e-learning and remote education initiatives?

Tables and Figures

Table 1: The types of multimedia technologies being used in e-learning and remote education initiatives

Types of Multimedia Technology	Frequency	Percent
Youtube	19	15.8
Zoom	58	48.3
Podcast	3	2.5
Facebook	32	26.7
Google Classroom	8	6.7
Total	120	100.0

Table 1 shows the type of multimedia technologies used in e-learning and remote education initiatives. It shows that 58 (48.3%) of the respondents claimed zoom is usually used, 32 (26.7%) claimed that Facebook, 19 (15.8%) claimed that YouTube, 8 (6.7%) claimed that Google Classroom while 3 (2.5%) claimed that Podcast. This implies that the majority of the respondents claimed that Zoom is often used in e-learning and remote education initiatives.

Table 2: The effectiveness of multimedia technology in improving student engagement and learning outcomes in e-learning

S/No	Statement	SA	A	N	D	SD	Mean	Stand Dev
1	Multimedia technology enables interactive learning experiences through simulations, virtual labs, and educational games	46 (38.3%)	64 (53.3%)	-	6 (5.0%)	4 (3.3%)	1.18	0.39
2	Adaptive learning platforms use multimedia content to deliver personalized instruction, adjusting the pace and level of difficulty according to each student's performance and style of learning	111 (92.5%)	-	-	4 (3.3%)	5 (4.2%)	1.79	0.51
3	Multimedia technology enhances accessibility by accommodating diverse learners, including those with disabilities or special needs	25 (20.8%)	95 (79.2%)	-	-	-	1.62	0.88
4	Engaging students with interactive multimedia content draws their interest and encourages them to take an active role in their education	42 (35.0%)	65 (54.2%)	13 (10.8%)	-	-	1.88	0.56
5	Multimedia technology facilitates the integration of real-world examples, case studies, and multimedia resources into the curriculum bringing about practical application	36 (30.0%)	75 (62.5%)	9 (7.5%)	-	-	2.98	1.27

Table 2 shows that 64 (53.3%) and 46 (38.3%) agree and strongly agree respectively that multimedia technology enables interactive learning experiences through simulations, virtual labs, and educational games, 6 (5.0%) disagree while 4 (3.3%) strongly disagree with the statement. Also, 111 (92.5%) of the respondents strongly agree that adaptive learning platforms use multimedia content to deliver personalized instruction, adjusting the pace and difficulty level based on each student's performance and learning style, 4 (3.3%) disagree while 5 (4.2%) strongly disagree.

In addition, 95 (79.2%) and 25 (20.8%) of the respondents agree and strongly agree respectively that multimedia technology enhances accessibility by accommodating diverse learners, including those

with disabilities or special needs, 65 (54.2%) and 42 (35.0%) Respondents agree and strongly agree, respectively, that engaging students with interactive multimedia material draws their curiosity and inspires them to take an active role in their education while 13 (10.8%) were undecided on the statement. Furthermore, 75 (62.5%) and 36 (30.0%) of the respondents respectively agree and strongly agree that multimedia technology facilitates the integration of real-world examples, case studies, and multimedia resources into the curriculum bringing about practical application while 9 (7.5%) were undecided on the statement.

Table 3: The Challenges of using multimedia technology in facilitating e-learning and remote education initiatives

S/No	Statement	SA	A	N	D	SD	Mean	Stand Dev
1	Poor and unreliable internet connectivity can be a significant barrier to utilizing multimedia technology	44 (36.7%)	63 (52.5%)	-	13 (10.8%)	-	3.84	1.87
2	Shortage of multimedia devices can impede the use of multimedia technology in facilitating e-learning	115 (95.8%)	-	-	5 (4.2%)	-	1.78	0.55
3	A shortage of ICT professionals in handling multimedia technology can hinder the use of the technology	46 (38.3%)	25 (20.8%)	19 (15.8%)	18 (15.0%)	12 (10.0%)	3.68	0.98
4	Technical glitches, software bugs, and hardware limitations can disrupt the delivery of multimedia content and impede students' learning progress	45 (37.5%)	46 (38.3%)	18 (15.0%)	11 (9.2%)	-	3.30	1.24
5	Lack of funding to acquire multimedia gadgets for e-learning can hinder the use of the technology	40 (33.3%)	30 (25.0%)	27 (22.5%)	23 (19.2%)	-	1.84	0.87

Table 3 shows that 63 (52.5%) and 47 (39.2%) of the respondents agree and strongly agree that poor and unreliable internet connectivity can be a significant barrier in utilising multimedia technology while 13 (10.8%) disagree on the statement. Also, 115 (95.8%) of the respondents strongly agree that shortage of multimedia devices can impede the use of multimedia technology in facilitating e-learning while 5 (4.2%) disagree. In addition, 25 (20.8%) and 46 (38.3%) of the respondents agree and strongly agree respectively that shortage of ICT professionals in handling multimedia technology can hinder the use of the technology, 19 (15.8%) were undecided, 18 (15.0%) disagree while 12 (10.0%) strongly disagree. In addition, 46 (38.3%) and 45 (37.5%) of the respondents strongly agree and agree respectively that technical glitches, software bugs, and hardware limitations can disrupt the delivery of multimedia content and impede students' learning progress, 18 (15.0%) were undecided while 11 (9.2%) disagree. Furthermore, 30 (25.0%) and 40 (33.3%) of the respondents agree and strongly agree respectively that lack of funding to acquire multimedia gadgets for e-learning can hinder the use of the technology, 27 (22.5%) were undecided while 23 (19.2%) disagree.

Hypothesis

H_0: There is no significant impact of multimedia technology on e-learning

Table 4: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.902[a]	.814	.812	.432

a. Predictors: (Constant), YouTube, Zoom, Podcast, Facebook, and Google Classroom

Table 5: ANOVA

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	467.001	5	93.400	396.235	.000[b]
	Residual	26.872	114	.236		
	Total	493.873	119			

a. Dependent Variable: E-learning
b. Predictors: (Constant), Youtube, Zoom, Podcast, Facebook and Google classroom

Table 6: Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	.901	.245		3.672	.000
	Facebook	.962	.052	.529	18.510	.000
	Zoom	.757	.041	.624	18.522	.000
	Podcast	.038	.032	.039	1.187	.237
	Google classroom	.128	.020	.154	6.273	.000
	Youtube	.226	.032	.239	7.088	.000

a. Dependent Variable: E-learning

Multimedia technology, including YouTube, Zoom, podcasts, Facebook, and Google Classroom, has an important effect on e-learning, according to the hypothesis's conclusion [(R2 =.814; F (5, 119) = 396.235; p <.05)]. This suggests that the combined impact of multimedia technology (Zoom, YouTube, Podcast, Facebook, and Google Classroom) on observed variance in e-learning wasapproximately81.4%.

Furthermore, the model's coefficients of multiple determination reveal that Zoom, Facebook, YouTube, and Google Classroom each made a significant independent contribution (β =.624; t = 18.522; p<.000), (β =.529, t = 18.510; p<.000), (β =.239, t = 7.088; p<.000), and (β =.154, t = 6.273; p<.000), but the podcast did not make a statistically significant contribution. Zoom has the largest magnitude (β =.624) in terms of order of magnitude, followed by Facebook (β =.529)

Result

The result of this study revealed that the multimedia technologies commonly used for e-learning and remote education initiatives are YouTube, Zoom, Podcast, Facebook, and Google Classroom. Also, the majority of the respondents agree that Multimedia technology facilitates the integration of real-world examples, case studies, and multimedia resources into the curriculum bringing about the practical application (X = 2.98, SD = 1.27) and Poor and unreliable internet connectivity can be a significant barrier in utilizing multimedia technology (X = 3.84, SD =1.87).

Furthermore, the result of the hypothesis revealed that multimedia technology (YouTube, Zoom,

Podcast, Facebook, and Google Classroom) significantly impacted e-learning [(R^2 = .814; F (5, 119) = 396.235; p < .05)] jointly accounted for about 81.4% of the variance observable in e-learning.

The independent contribution of Zoom, Facebook, YouTube and Google classroom were significant ((β = .624; t = 18.522; p< .000), (β = .529, t = 18.510; p< .000), (β = .239, t = 7.088; p< .000) and (β = .154, t = 6.273; p< .000) while that of podcast was not statistically significant. In order of magnitude, Zoom had the highest magnitude (β = .624), followed by Facebook (β = .529). This finding supports the study of Aboderin (2015) who reported that tools available for e-learning are limited and the few available are not satisfactorily utilised

Discussion

There is a need to invest in infrastructure development to improve access to reliable internet connectivity and electricity in Ogun State's urban and rural areas. There is a need to integrate multimedia technology into teaching pedagogy and instructional practices to create interactive, student-centered learning experiences. There is equally a need to implement comprehensive digital literacy training programs for teachers, students, and other education stakeholders to enhance their proficiency in using multimedia technology effectively.

Conclusion

According to the study's findings multimedia technology had a big influence on initiatives for remote learning and e-learning. Students learning experiences were greatly improved by multimedia technology which made a variety of educational resources, interactive content, and individualized learning experiences available. Multimedia technology adoption increases educational accessibility especially for students in underserved or remote areas. Students can get high-quality instructional materials from any location with an internet connection by utilizing digital platforms and online resources. Multimedia technologies can also be used to accommodate different learning preferences and styles which could increase educational equity and inclusivity. Teachers are also empowered by multimedia technology since it gives them the means to design dynamic and captivating learning environments. By means of training initiatives and professional development programs educators can improve their digital literacy and effectively utilize multimedia technologies in the classroom.

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