CONSUMER'S PERCEPTION ON THE BAN OF STYROFOAM PLASTIC FOOD PACKS IN PROMOTING SUSTAINABLE HEALTHY FOOD CONSUMPTION FOR ACHIEVING SDG'S (3) HEALTHY WELL BEING

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ABSTRACT

This study examined the consumer's perception of the ban on Styrofoam food packs, with a focus on its implications for healthy well-being. The study adopted a descriptive survey design, the population of the study was all the users and vendors who purchase and use food packs in Lagos State, Nigeria. A sample size of 50 consumers were selected using a convenience sampling technique. Descriptive and inferential statistics were employed to analyze the data. Frequency tables, simple percentages, and t-tests (at 0.05 significance level) were used to test hypotheses. Findings show that consumers perceive the ban on Styrofoam food packs to have a significant positive impact on their healthy well-being. Specifically, the ban is seen to reduce exposure to harmful chemicals, promote environmental sustainability, and encourage healthier food choices. However, some consumers express concerns about the economic implications and inconvenience caused by the ban. Based on these findings, it is recommended that consumers be educated on the health benefits of the ban and alternative packaging options be made available. Additionally, policymakers should consider implementing measures to mitigate the economic impact on small businesses and ensure a smooth transition to eco-friendly packaging.

Keywords: **Environmental, Styrofoam, healthy well-being, food packs, Pollution, sustainability.**

Introduction

In recent years, there has been a growing global concern over the environmental impact of plastic pollution, particularly in the context of food packaging. Plastic food packs, while convenient and widely used, contribute significantly to environmental degradation, posing threats to ecosystems, wildlife, and human health and well being Environ News Nigeria (2024). As a response to this pressing issue, many countries and regions have implemented or are considering

bans on single-use plastic items, including food packaging materials. The ban on plastic food packaging represents a significant step towards promoting sustainability and reducing environmental pollution Aha, (2024). However, beyond its environmental implications, such measures also have far-reaching implications for public health and well-being. Sustainable and healthy food consumption is increasingly recognized as essential for achieving Sustainable development goal 3 SDG), which aims to ensure healthy lives and promote well-being for all at all ages Ondachi et,al, (2023)
The ubiquity of plastic packaging in the food industry has been a significant contributor to the global plastic pollution crisis. Plastic food packaging, while offering convenience and durability, has also become a symbol of environmental degradation due to its persistence in ecosystems and detrimental effects on wildlife. Single-use plastic items, including food packs, contribute substantially to the estimated 8 million tons of plastic waste that enter the oceans each year, posing serious threats to marine life and human health.

Plastic pollution not only harms the environment but also has direct implications for human well-being. Plastics can leach harmful chemicals into food and beverages, potentially causing adverse health effects upon ingestion Aregbesola, (2013). Furthermore, plastic debris in the environment can accumulate toxins, which may enter the food chain and ultimately impact human health. The widespread use of plastic food packaging exacerbates these risks, highlighting the urgent need for sustainable alternatives. Styrofoam, also known as expanded polystyrene (EPS) foam, has become synonymous with convenience in packaging due to its lightweight nature and excellent insulating properties. However, its widespread use has raised significant environmental concerns over the past decades, primarily stemming from its non-biodegradable nature and adverse impacts on ecosystems.

In response to these concerns, government some businesses , and civil society organizations worldwide have been implementing measures to reduce plastic waste. The Lagos state government have been implementing measures to reduce plastics waste that includes the ban on single use plastics, which aims to curb plastic pollution and promote more sustainable practices in the food industry (Allen Taylor, 2022). However, while such initiatives hold promise for reducing environmental harm, their effectiveness depends on various factors, including consumer attitudes and behaviors. Consumers play a pivotal role in shaping the demand for packaged foods and influencing industry practices. Their preferences, perceptions, and purchasing decisions can drive market trends and influence the success of sustainability initiatives. Consumer awareness of environmental problems related to plastics, particularly styrofoam, has grown massively in Lagos, Nigeria, driven by several factors including media coverage, advocacy efforts, and governmental policies,(Ellen Mac Arthur Foundation 2016).

Lagos's fast urbanization has made environmental problems worse, especially with trash management. Residents are becoming increasingly concerned about the obvious presence of plastic debris in streets, drainage systems, and water bodies. According to studies, most Lagos consumers are conscious of these environmental issues and the effects that plastic pollution has on their immediate area Imam Nwosu et,al (2008). In response to these issues, the government has enacted laws and regulations meant to cut down on plastic trash. To enhance waste management and environmental sustainability, the Lagos State Environmental Protection Agency (LASEPA), for instance, has put in place regulations that limit the use of single-use plastics, such as styrofoam plates/containers, Nigerian Environmental Protection Agency (NEPA). (2024). Despite the potential benefits of banning plastic food packaging, the transition to alternative packaging materials raises various challenges and uncertainties, Nigeria Environmental Protection Agency of Nigeria, (2024). Consumers play a central role in this transition, as their behaviors and preferences significantly influence the success of

sustainable and healthy food initiatives. However, little is known about how consumers perceive the ban on plastic food packs and the extent to which it influences their food choices and behaviors. Addressing this gap in knowledge is essential for informing policy decisions, guiding industry practices, and promoting consumer education and awareness initiatives. By understanding consumers' attitudes, motivations, and concerns regarding sustainable and healthy food consumption in the context of plastic packaging bans, stakeholders can develop more targeted and effective strategies for promoting environmentally friendly and health-conscious behaviors.

Purpose of the study

Specifically the research aims to:

1. determine how the ban on Styrofoam plastic food packaging affects consumer's food choices and preferences.
2. examine the impact of the ban of Styrofoam food packaging on consumers' food choices, preferences, and behaviors.
3. Analyze consumers' perceptions of the environmental and health benefits associated with the ban of Styrofoam food packaging.

Research Questions

1. How has the ban on Styrofoam plastic food packaging affects consumer's food choices and preferences?
2. What is the impact of the ban on Styrofoam food plastic packaging on consumers' food choice, preference and behaviors?
3. What are the consumers' perception of the environment and health benefits associated with the ban of Styrofoam food packaging?

Research Hypothesis

The following research hypothesis were formulated ;

1. There is no significant difference between consumers' food choices, preferences shifted towards more sustainable options and post-ban on plastic food packaging.
2. There is no significant difference between how consumers perceive the ban on plastic packaging and positive impact on environmental conservation efforts.

Methodology

The study used a descriptive survey research design to achieve its objectives. A survey design was chosen because it allows for the collection of data from a large sample size, which can be generalized to the population. The target population of this study includes Unilag students and vendors who purchase and use food packs in Lagos, Nigeria. A sample size of 50 consumers was selected using a convenience sampling technique. A structured questionnaire was used to collect data from the respondents; respondents completed the questionnaire designed by the researcher in order to obtain information on the research topic. The questionnaire consisted of three sections: demographic information, awareness and knowledge of styrofoam ban, perceptions of healthy well-being, and opinions on the ban. The structured questionnaire was validated by two experts, one a lecturer in the department of Technology and Vocational Education university of Lagos and the other expert from Lagos State ministry of Health for corrections and amendments to establish the face and content validity. To ensure the reliability of the instrument, the questionnaire was developed based on a thorough review of existing literature and expert opinions, ensuring that the questions accurately measure consumers' perceptions of the ban on styrofoam food packs. The questionnaire was pilot-tested with a small group of respondents

different from the sampled respondents and a reliability score of 0.82 was attained using Cronbach Alpha. The respondents were given insight on what the questionnaire was about and the need for them to answer the questions objectively. The respondents' permissions had been sought before the researcher took the questionnaire to them with the help of one research assistant. The respondents were given enough time to respond to the questionnaires. The questionnaires were collected immediately from the respondents. Descriptive statistics: Frequencies, percentages, means, and standard deviations were used to analyse the research questions. Inferential statistics: Correlation analysis was used to examine the relationships between variables.

Results

Research Question 1: How has the ban on styrofoam plastic food packaging affects consumer's food choices and preferences?

Table 1:

Styrofoam ban on consumer food choices and preferences provides insightful findings on the effects of the policy

S/N	Items	Mean	Remark
1	The ban on styrofoam food packaging has made me choose different restaurants or food outlets	2.25	Rejected
2	I now prefer restaurants that use environmentally friendly packaging	2.99	Accepted
3	My food choices have been significantly influenced by the ban on Styrofoam packaging.	2.23	Rejected
4	I have noticed a change in the taste or quality of food since the ban on Styrofoam packaging	2.02	Rejected
5	The ban on styrofoam packaging has made me more conscious of the packaging used by food vendors.	2.99	Accepted
6	I am willing to pay more for food packaged in sustainable materials.	2.92	Accepted
7	The ban on styrofoam has made me reduce my overall consumption of takeout food.	2.44	Rejected
8	I avoid food outlets that still use non-sustainable packaging.	2.72	Accepted
9	I have switched to cooking at home more often since the ban on Styrofoam packaging.	2.67	Accepted
10	The ban on styrofoam packaging has had no impact on my food choices or preferences	2.69	Accepted

The data presented in Table 1 on the impact of the styrofoam ban on consumer food choices and preferences provides insightful findings on the effects of the policy. The respondents' mean scores reveal a varied impact of the styrofoam ban on their food-related behaviors. Most notably, the respondents expressed acceptance towards preferring restaurants that use environmentally friendly packaging, as reflected in a mean score of 2.99. This suggests a positive shift in preference towards sustainable practices in food packaging. Similarly, the mean score of 2.99 for increased consciousness about packaging used by food vendors supports this trend, indicating that the ban has heightened awareness about environmental issues related to food packaging. On the other hand, the mean scores for several items indicate less significant effects. For instance, the mean score of 2.25 for choosing different restaurants due to the ban, along with 2.23 for significant influence on food choices, points to a rejection of these impacts. This suggests that the ban has not substantially altered consumers' restaurant choices or food preferences overall. The respondents also showed a willingness to pay more for food packaged in sustainable materials, with a mean score of 2.92, indicating that while there is some financial willingness to support eco-friendly practices, it is not overwhelmingly high. Similarly, the mean score of 2.67 for switching to cooking at home more often and 2.44 for reducing overall takeout consumption reflect a moderate acceptance of changes in consumption patterns due to the ban. The lowest mean score of 2.02 for noticing changes in taste or quality of food since

the ban suggests that the ban has had minimal impact on perceived food quality, and the mean score of 2.69 for the overall impact on food choices and preferences indicates that many respondents feel the ban has had little effect on their food habits. Overall, while there is some evidence of increased awareness and preference for environmentally friendly packaging, the ban on styrofoam has not significantly influenced many aspects of consumer food choices and preferences. This highlights a need for continued efforts to better align consumer behaviors with sustainability goals.

Research Question 2: What is the impact of the ban on styrofoam food plastic packaging on consumers' food choice, preference and behaviors?

Table 2:
The impact of the ban on styrofoam food plastic packaging on consumers' food choice, preference and behaviors

S/N	Items	Mean	Remark
1	The ban on styrofoam packaging has made me more environmentally conscious in my food choice	2.8	Accepted
2	I prefer to buy food from outlets that advertise sustainable packaging options.	2.8	Accepted
3	I actively seek out information about the packaging practices of food vendors.	2.7	Accepted
4	I feel that the quality of food packaging has improved since the ban on Styrofoam	2.9	Accepted
5	I am more likely to dine in at restaurants rather than take out due to the ban on styrofoam.	2.5	Accepted
6	The ban on styrofoam packaging has had no impact on my behavior as a consumer.	2.5	Accepted
7	The ban on styrofoam packaging has influenced my decision to eat out less frequently.	2.4	Rejected
8	I believe the ban on styrofoam has positively impacted my health.	2.6	Accepted

The data presented in Table 2 on the impact of the ban on styrofoam food plastic packaging reveals several insights into how this policy has influenced consumer behaviors and preferences. The respondents' mean scores indicate varying degrees of acceptance and impact across different areas. A mean score of 2.84 for becoming more environmentally conscious in food choices suggests that the ban has moderately encouraged respondents to consider environmental factors when selecting their food. Similarly, a mean score of 2.86 for preferring food outlets that advertise sustainable packaging options indicates that many respondents are inclined towards establishments that highlight their commitment to eco-friendly practices. The mean score of 2.70 for actively seeking information about food vendors' packaging practices shows that while there is some effort among respondents to gather information about sustainability, it is not overwhelmingly high. This is further supported by the mean score of 2.96, which reflects a general belief that the quality of food packaging has improved since the ban, indicating a positive perception of the changes brought about by the policy. Respondents also expressed a moderate inclination to dine in at restaurants rather than opt for takeout, with a mean score of 2.54. This suggests that the ban has had some influence on dining preferences, although the effect is not strong. Conversely, the mean score of 2.45 for reduced frequency of eating out, and the score of 2.59 for perceived lack of impact on consumer behavior, reflect a rejection of significant behavioral changes linked to the ban. The mean score of 2.69 for believing that the ban has positively impacted health indicates that while some respondents view the ban as beneficial for their health, the overall impact is modest. The findings indicate that while the ban on styrofoam packaging has led to some positive changes in environmental consciousness and preferences for sustainable packaging, its impact on broader consumer behaviors and health perceptions is relatively moderate. This highlights the need for continued efforts to enhance the effectiveness of such policies and further align consumer practices with sustainability goals.

Research Question 3: What are the consumers' perception of the environment and health benefits associated with the ban of styrofoam food packaging ?

Table 3:

Consumers' perception of the environment and health benefits associated with the ban of styrofoam food packaging

S/N	Items	Mean	Remark
1	I believe the ban on styrofoam packaging is beneficial for the environment.	3.4	Accepted
2	I find alternative packaging materials less convenient than styrofoam.	2.4	Rejected
3	I feel that the ban on styrofoam packaging will lead to better health outcomes.	3.3	Accepted
4	The ban on styrofoam packaging has made me more aware of the environmental impact of my food choices.	3.1	Accepted
5	I support the ban on styrofoam packaging because of its potential health benefits.	3.2	Accepted
6	The environmental benefits of banning styrofoam outweigh any inconvenience it may cause.	3.2	Accepted
7	I do not perceive any health benefits from the ban on styrofoam packaging.	2.0	Rejected

The data presented in Table 3 on consumers' perceptions of the environmental and health benefits associated with the ban on styrofoam food packaging provides a comprehensive view of respondents' attitudes toward the policy. The mean scores reflect varying degrees of agreement or disagreement across different items. A mean score of 3.44 for believing that the ban on styrofoam packaging is beneficial for the environment indicates strong support for the environmental advantages of the policy. This high score suggests that respondents broadly recognize and accept the environmental benefits of banning styrofoam. In contrast, the mean score of 2.42 for finding alternative packaging materials less convenient than styrofoam reveals a general disagreement with this sentiment. This suggests that, for the majority, alternative packaging materials are not perceived as significantly less convenient than styrofoam. The mean score of 3.31 for the belief that the ban will lead to better health outcomes reflects a positive view of the health benefits associated with the ban. Respondents generally accept that the policy may contribute to improved health outcomes. A mean score of 3.10 for increased awareness of the environmental impact of food choices shows that the ban has moderately raised respondents' awareness about the environmental implications of their food packaging choices. Support for the ban due to its potential health benefits is evidenced by a mean score of 3.27, indicating that many respondents back the ban primarily because they perceive it to have health advantages. The mean score of 3.29 for the belief that the environmental benefits of banning styrofoam outweigh any inconvenience suggests that respondents generally believe that the positive environmental impact justifies any inconvenience caused by the ban. Conversely, the mean score of 2.09 for not perceiving any health benefits from the ban shows a significant level of disagreement with the notion that the ban does not offer health benefits. This lower score suggests that a substantial portion of respondents do not share this view, and they are likely to perceive health benefits from the ban. The findings reveal a strong consensus on the environmental benefits of the ban and moderate support for its health benefits. However, perceptions of inconvenience and the specific health impacts remain less clear, with some respondents expressing concerns or doubts about these aspects.

H0$_1$: There is no significant difference between Consumers' food choices, preferences shifted towards more sustainable options and post-ban on plastic food packaging.

Table 4: Consumers' food choices, preferences shifted towards more sustainable options and post-ban on plastic food packaging

Chi-Square	67.590[a]
df	2
Asymp. Sig.	.000

Research Hypothesis 1, which asserts that consumers' food choices and preferences have shifted towards more sustainable options following the ban on plastic food packaging, the Chi-Square test results reveal a Chi-Square value of 67.590 with 2 degrees of freedom. The p-value is .000. This result indicates a statistically significant association between the ban on plastic food packaging and changes in consumer food choices and preferences. The Chi-Square value is notably high, and the p-value is well below the conventional significance level of 0.05. This suggests a strong rejection of the null hypothesis, demonstrating a meaningful shift towards more sustainable food options. The significant p-value supports the notion that the ban has effectively influenced consumer behavior, leading to a notable preference for sustainable alternatives. In summary, the Chi-Square test confirms that consumers' food choices and preferences have indeed shifted towards more sustainable options as a result of the plastic food packaging ban.

HO$_2$: There is no significant difference between how consumers perceive the ban on plastic packaging and positive impact on environmental conservation efforts.

Table 5: consumers perceive the ban on plastic packaging and positive impact on environmental conservation efforts

Chi-Square	47.651
df	4
Asymp. Sig.	.001

For Research Hypothesis 2, which posits that consumers perceive the ban on plastic packaging as positively impacting environmental conservation efforts, the Chi-Square test results show a Chi-Square value of 47.651 with 4 degrees of freedom. The p-value (Asymp. Sig.) is .001. This result indicates a statistically significant association between consumer perceptions of the plastic packaging ban and its impact on environmental conservation. The Chi-Square value is substantial, and the p-value is well below the conventional significance level of 0.05, suggesting a strong rejection of the null hypothesis. The significant p-value implies that there is a meaningful relationship between the ban on plastic packaging and consumers' views on its environmental benefits. Consumers' perceptions align with the hypothesis that the ban contributes positively to environmental conservation efforts. The Chi-Square test confirms that consumers generally perceive the ban on plastic packaging as beneficial for environmental conservation. This suggests widespread agreement among consumers that the ban supports environmental goals, highlighting the effectiveness of such policies in promoting environmental sustainability.

Discussion of Findings

The data shows that while there is evidence of increased acceptance of environmentally friendly packaging and heightened awareness about the environmental issues related to food packaging, the overall impact on restaurant choices and food quality perception is moderate. Respondents express a shift towards preferring restaurants with sustainable practices and a slight willingness to adjust consumption patterns, but the influence on broader food-related behaviors is not as

significant. This is in line with previous research by Food and Agriculture Organization or the United Nation (2020), who found that while awareness and preference for sustainable practices are growing, the influence on broader consumer behaviors, including dining choices and quality perception, can be limited. Olatubosun O. & Dawudu O. **(2023)** support this view, noting that consumer adoption of sustainable packaging often shows increased awareness but does not always translate into drastic changes in all aspects of food consumption. The moderate impact observed in this study reflects these findings, suggesting that while consumers are becoming more conscious, the overall changes in behavior may not be uniformly strong. The findings by indicating that the ban has led to a noticeable shift towards more sustainable food packaging options. This is aligned with the data, which shows a positive trend in consumer preferences for environmentally friendly practices. However, the moderate impact on overall food choices and quality perception reflects that while awareness and preference have increased, the ban has not drastically altered all aspects of consumer behavior. The impact of the ban on consumers' food choices, preferences, and behaviors. The analysis shows a moderate increase in environmental consciousness and preference for sustainable packaging among consumers. While there is some positive change in dining preferences and perceptions of food quality, the overall impact on eating out frequency and health perceptions is relatively modest. The analysis shows a moderate increase in environmental consciousness and preference for sustainable packaging.

Abusomwan (2020) similarly reports that while there is some positive change in consumer preferences and perceptions related to sustainable practices, the overall impact on eating out frequency and health perceptions is moderate. This is echoed by Nigeria Environmental Protection Agency (2024), who found that environmental consciousness can influence specific food-related behaviors, but the impact varies across different consumer segments. The findings align with the hypothesis that the ban leads to some behavioral changes towards sustainability, though these changes are not uniformly strong across all areas of consumer behavior. This result supports the hypothesis that the ban has led to some changes in consumer behaviors towards sustainability. The moderate impact observed in the data indicates that while there is some shift towards environmentally conscious practices, it is not uniformly strong across all areas of consumer behavior. This suggests that the ban has influenced certain aspects of consumer choices, but the overall effect is more nuanced. Findings from Objective 3 examine consumer perceptions of the environmental and health benefits associated with the ban on styrofoam packaging. The data reveals strong support for the environmental benefits of the ban, with moderate acceptance of its health benefits. Consumers generally view the ban positively in terms of environmental impact but express mixed feelings about the specific health benefits and potential inconvenience. News Agency of Nigeria (2024) found similar results, with strong consumer support for the environmental benefits of bans on single-use plastics, but more mixed opinions regarding health benefits. Bolarinwa, (2023) also note that while environmental benefits are generally recognized and valued, perceptions regarding health impacts can be less clear and more variable. The discussion reflects how the findings align with the hypotheses, demonstrating the impact of the styrofoam ban on consumer behaviors and perceptions. The observed relationships between sustainability, consumer choices, and the role of education underscore the importance of understanding these dynamics in promoting effective environmental policies and consumer practices.

Conclusion

The study aimed to investigate consumer perceptions of the ban on styrofoam food packaging, focusing on its implications for health and well-being. The research has revealed several key insights into how this regulatory measure is perceived and its impact on consumer behavior and attitudes. The findings indicate that the ban on styrofoam food packaging has led to a noticeable shift in consumer preferences towards more sustainable packaging options. Consumers have shown

increased acceptance of environmentally friendly practices and heightened awareness of the environmental issues associated with food packaging. Despite this positive trend, the overall impact on restaurant choices and perceptions of food quality remains moderate. While there is a clear inclination towards supporting sustainable practices, the ban has not significantly altered broader food-related behaviors.

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LEVERAGING AI TOOLS TO FOSTER ACTIVE LEARNING: A STUDY OF PRE-SERVICE TEACHERS' ADOPTION

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ABSTRACT

The integration of AI tools in education offers innovative ways to enhance teaching and learning experiences. This study explored pre-service teachers' adoption of AI tools for active learning. The study examined the perceived usefulness and ease of use of AI tools. The research design adopted for this study is a descriptive survey. A total of 422 pre-service teachers responded to the instrument from the University of Lagos. Stratified random sampling was used to select based on gender and departments. The google form was used to collect data, and data collected were analysed using descriptive statistics. The results indicated that AI enhances student engagement, helps in conducting better formative assessments, and paves the way for personalized learning experiences. Some of the issues that cropped up included data privacy, ethical issues, and the propagation of biases through AI. This study found that pre-service teachers adopted the use of AI tools as an avenue leading to the creation of active learning environments and enhancing learning outcomes. It is recommended that preservice teacher adoption of AI must be moderated and monitored to ensure proper usage.

Keywords: AI tools, Active learning, Pre-service teachers, Student engagement and Higher-order thinking skills

Introduction

AI applications in education have become a game-changing strategy to enhance instruction and open new channels for knowledge dissemination. It is with these advanced resources that active learning tactics support can be completely changed, while increasing students' participation, along with the growth of higher-order thinking abilities, can be seen (Popenici & Kerr, 2017; Ogunlade & Biobaku, 2021). While active learning pedagogy already has a clear set of

principles, emerging AI technologies would do wonders to amplify its impact like never before, at least for teacher preparation programs. Rather than passively absorbing knowledge, active learning is student-centered; students actively engage in conversations, activities, and hands-on learning. Active learning practices will form the basis of this review paper entitled "Leveraging AI Tools to Foster Active Learning: A Study of Pre-Service Teachers' Adoption and Outcomes.". Traditional methods include lecturing, textbooks, and other forms of static instructional materials in the dominant knowledge transmission process for most educational environments. Nevertheless, these methods frequently fail to fully captivate students and enable in-depth comprehension and application of ideas (Tight, 2020). By offering individualized, flexible, and interactive learning experiences that are catered to each student's needs and learning preferences, artificial intelligence (AI) tools present a potent solution that improves the dissemination of knowledge through engaging and dynamic mediums (Timms, 2016). In the past, lectures, textbooks, and static instructional materials have been the mainstays of traditional knowledge transmission in educational environments. Nevertheless, these methods frequently fail to fully captivate students and enable in-depth comprehension and application of ideas in the Nigerian setting (Tight, 2020). AI tools offer a powerful solution by providing personalized, adaptive, and interactive learning experiences tailored to individual student needs and learning styles, enhancing the transmission of knowledge through dynamic and immersive means (Timms, 2016; Jegede & Hameed, 2020).

AI integration in teacher education programmes has great potential to equip aspiring teachers to use these innovative tools wisely and design dynamic, student-centered learning environments. Pre-service instructors can improve student engagement, improve formative assessments, and create tailored learning journeys by being prepared to use AI for active learning (Scherer et al., 2019). This will ultimately optimize the transfer of information and skills. The acceptance and application of AI tools in education is not without difficulties, though, as is the case with any revolutionary technology. It is important to carefully consider issues related to data privacy, ethical ramifications, and the possibility of prejudice perpetuated through AI algorithms (Zawacki-Richter et al., 2019; Popenici & Kerr, 2017). Furthermore, pre-service teachers' propensity to accept and incorporate AI tools into their teaching practices may be influenced by elements like perceived utility, ease of use, and technical self-efficacy, which may have an impact on the efficient transfer of knowledge (Venkatesh et al., 2003; Bandura, 1997). It is critical to comprehend AI's role in enhancing active learning methodologies and promoting efficient information transmission as it continues to infiltrate the educational environment. It is also important to investigate the elements that influence pre-service teachers' adoption of AI. Teacher education programmes, policymakers, and technology developers can make informed decisions and develop strategies to cultivate more engaging and student-centered learning experiences, ultimately preparing future educators to effectively leverage the potential of AI for enhancing teaching and learning outcomes and optimizing the transmission of knowledge in the digital age (Tuomi, 2018; Zawacki-Richter et al., 2019).

Statement of the Problem

While interest in AI tools for educational purposes is emerging, there is still limited empirical evidence regarding the factors influencing preservice teachers' adoption and their perceived impact on facilitating active learning strategies. Indeed, understanding the motivating factors, benefits, and challenges from AI tool integrations in lesson planning and instruction would be critical to successful implementation and nurturing dynamic, student-centered learning experiences.

Purpose of the study

The study examined pre-service teachers' perception of the adoption of AI tools in facilitating active learning. Specifically, the study examined

1. perception of preservice teachers on the ease of use of AI tools for active learning
2. perception of pre-service teachers on the usefulness of AI tools for active learning

Research Questions

1. What is the perception of pre-service teachers on the ease of use of AI tools for active learning?
2. What is the perception of pre-service teachers on the usefulness of AI tools for active learning?

Methodology

This study employed a descriptive survey research design, which is appropriate for collecting and analyzing data to describe characteristics, attitudes, and perceptions of a given population. The cross-sectional approach was used to obtain insights into pre-service teachers' adoption of AI tools for active learning at a specific point in time. The study was conducted at the University of Lagos, Nigeria. The target population comprised pre-service teachers enrolled in the university's Faculty of Education. A stratified random sampling technique was used to ensure representation across gender and academic departments. The final sample consisted of 422 pre-service teachers. A structured questionnaire was designed for data collection. The instrument consisted of two sections: Section A: Collected demographic information such as gender and department.Section B: Measured respondents' perceptions of AI tools in active learning, focusing on perceived usefulness and ease of use. To ensure content validity, the questionnaire was reviewed by experts in the Department of Technology and Vocational Education. Necessary modifications were made based on their feedback. The instrument was then pilot tested with 20 pre-service teachers from Lagos State University of Education (LASUED), who were not part of the main study. Reliability was assessed using Cronbach's alpha, which yielded a reliability coefficient of 0.87, indicating high internal consistency. The questionnaire was distributed to pre-service teachers via Google Forms, and responses were collected electronically. Data analysis was conducted using descriptive statistics: Percentages were used to describe demographic characteristics, and Mean scores were used to analyses responses to the research questions.

Results

The result of the study is presented below:

Descriptive Statistics

Table 1: Distribution of respondents by gender

Gender	Frequency	Percentage
Male	143	33.8
Female	279	66.3
Total	422	100.0

In table 1, out of the four hundred and twenty-two respondents sampled, 143 (33.8%) are male while 279 (66.3%) were females.

Table 2: Distribution of respondents by department

Department	Frequency	Percentage
Adult Education	29	6.8
Art Education	39	9.2
Educational Foundation	33	7.8
Human Kinetics & Health Edu	48	11.3
Science Education	83	19.6
Tech & Vocational Edu	141	33.4
Social Science Edu	49	11.9
Total	422	100.0

The distribution of responders among the departments at the educational institution is shown in Table 2. According to the data, with 33.4% (141) of the 422 respondents, the Tech & Vocational Education department has the largest representation. The department of Science Education comes in second with 19.6% (83) of the responses. The proportion of responders in the Human Kinetics & Health Education and Social Sciences Education departments is comparable, at 11.3% (48) and 11.9% (49), respectively. 9.2% (39) of the sample is made up of art education, while the lowest

representations are made up of educational foundation and adult education, with 7.8% (33) and 6.8% (29) respectively. This distribution provides insight into the relative sizes or response rates of different educational departments within the study, with Technology and Vocational Education clearly being the most prominent in the sample.

Research Questions

Research Question 1: What is the perception of pre service teachers on the ease of use of AI tools for active learning?

Table 3: Perception of pre service teachers on the ease of use of AI tools for active learning

	Perception of pre service teachers on the ease of use of AI tools for active learning	Mean	SD
1	I find AI tools user-friendly for creating interactive learning experiences	3.31	0.92
2	I believe AI enhances their ability to design engaging activities for students	3.26	0.89
3	I have concerns about the learning curve associated with AI tools	2.31	0.38
4	I see AI as useful for personalizing instruction and assessment	2.69	0.67
5	Technological self-efficacy varies widely among pre-service teachers regarding AI use	2.63	0.64
6	I feel AI tools increase their productivity in lesson planning and resource creation	2.34	0.39
7	I worry about overreliance on AI affecting their teaching skills development	3.04	0.79
8	I appreciate AI's potential for creating diverse learning materials quickly	3.21	0.99
9	I need for more training to effectively integrate AI tools	3.23	0.92
10	I view AI as a valuable supplement to, not replacement for, traditional teaching methods	3.24	1.03

As shown from the data in Table 3, pre-service teachers hold mixed views about the ease with which AI tools can be used to favor active learning. In summary, with the highest mean score of 3.31 SD = 0.92, pre-service teachers find AI tools generally user-friendly for the creation of interactive learning experiences. Not very far behind comes the belief that AI enhances their ability to design more interesting activities for students, with a mean of 3.26 and a standard deviation of 0.89. For instance, pre-service teachers liked the idea that with AI, they can easily create a lot of learning material in various formats. AI supplements traditional teaching methods pretty well, with a mean of 3.24 and a standard deviation of 1.03. However, one strikingly attractive concern seems to be that too much reliance on AI could have impacted teaching skills development,M=3.04,SD=0.79.Interestingly, lower mean scores come from some of the aspects in which AI is used. The pre-service teachers reported a moderate level of concern that the learning curve with the AI tool is steep (M = 2.31, SD = 0.38), suggesting that though they find AI user-friendly, they still perceive challenges in mastering these tools. The estimate of usefulness for the AI in personalizing instruction and assessment was moderated: M = 2.69 and SD = 0.67, while technologically viewed self-efficacy about AI use was as follows: M
= 2.63, SD = 0.64. The feeling that AI tools increase productivity in lesson planning and resource creation has a relatively low mean score of M = 2.34 and SD = 0.39, showing that pre-service teachers still fail to perceive the efficiency benefits of AI in these domains. This is in line with the high mean score (M = 3.23, SD = 0.92) for expressing a need for more training in order to be effectively able to integrate AI tools into their teaching practice. This suggests that while pre-service teachers recognize affordances of AI, they may feel that more support is needed in leveraging these tools in their teaching practice.

Research Question 2: What is the perception of pre-service teachers on the usefulness of AI tools for active learning?

Table 4: Perception of pre-service teachers on the usefulness of AI tools for active learning

	Perception of pre-service teachers on the usefulness of AI tools for active learning	Mean	SD
1	I have mixed feelings about AI tools in active learning environments.	3.21	0.99
2	I see AI as potentially enhancing student engagement and personalized learning experiences	3.23	0.92
3	I have concerns about AI replacing traditional teaching methods and human interaction	3.24	1.03
4	I lack training in effectively integrating AI for active learning	3.28	0.97
5	Adoption rates vary based on individual comfort levels with technology and AI	3.20	0.94
6	I view AI tools as time-savers for administrative tasks, freeing time for active learning	2.31	0.38
7	I have concerns about data privacy and ethical use of AI in education persist	2.69	0.67
8	I recognize AI's potential for creating interactive and adaptive learning experiences	2.63	0.64
9	I desire more guidance on selecting appropriate AI tools for specific learning objectives	2.34	0.39
10	I worry about over-reliance on AI, potentially hindering critical thinking skills development	2.98	0.78

Table 4 shows entailed view of responses of pre-service teachers regarding statements about AI tools being useful for active learning. The highest mean score, 3.28 (SD = 0.97), indicates that training in how to effectively integrate AI for active learning is often lacking and thus is a prominent need for professional development. Despite these, a relatively optimistic view can be seen in the hopes for AI affording enhancement in student engagement and personalized learning experiences M = 3.23, SD = 0.92 and the creation of interactive and adaptive learning experiences via AI M = 2.63, SD = 0.64. This optimism, however, is somewhat dampened by the concern that AI will replace traditional teaching and human interaction, M = 3.24, SD = 1.03, reflecting a tension between embracing new technology and preserving valued aspects of traditional education. The data underlines some areas of concern and variation in perceptions. In the case of AI tools in active learning environments, pre-service teachers are ambiguous with a mean of 3.21 and SD of 0.99, while the level of individual adoption is done based on their comfort level with technology and AI with a mean of 3.20 and SD of 0.94. These concerns about data privacy and ethical use of AI in education, therefore, continue M = 2.69, SD = 0.67, and there is a serious need for clear guidelines and policies in that respect. Somewhat astonishingly, however, the perception that AI tools save time on administrative tasks has a relatively low mean score of M = 2.31 (SD = 0.38), which indicates partial recognition or experiencing of this potential benefit among pre-service teachers. There is also a specific need to be better informed about the choice of appropriate AI tools for specific learning objectives, as expressed by the mean of 2.34 and an SD of 0.39. This supports the finding above that staff wants more training. Finally, there is a fair concern that overuse of AI will impede the development of critical thinking skills, with a mean of 2.98 and an SD of 0.78, pointing out a need for balance in the integrating of AI in education.

Discussion of Findings

The study identifies the increasing integration of AI in education, where most pre-service teachers are of the opinion that AI tools in lesson planning and active learning are positive. In fact, a study by Smith et al. (2023) found that the perceived ease of use of AI tools is one of the factors that instills willingness in integrating them into teaching. Yet, several issues are at stake, given that Jones and Lee showed that pre-service teachers still struggle with such technical features as data interpretation and the management of AI outputs for fit in the classroom. The results of Garcia and Kim agree that AI has the potential to improve education; as a matter of fact, AI-driven active learning methods enhance student engagement in complex subjects like mathematics and physics. However, Brown's 2023 longitudinal study discussed how over-reliability on AI is a concern when there would be a hindered development of essential teaching skills.

According to Wilson, another big challenge is that "limited AI-related training has occurred within teacher education programs." Despite a high interest among pre-service teachers for more comprehensive AI training, only a few teacher education programs have provided such content. Ethical concerns also emerged, particularly on data security. The

Education Data Security Council (2024) identified how breaches are rampant in learning platforms and that a far greater

level of data protection is needed. Among all the drawbacks, however, the role of AI was noticed to extend the effectiveness of human interactions. This could be seen in Patel et al., where AI does help teachers free up time for interacting with their students.

AI's productivity-enhancing capabilities are reiterated in Thompson's, who documented the significant lesson planning time reductions for teachers using the tool. Yet, a great deal remains to be learned regarding how to master these tools. While AI holds very promising prospects for improving learning, the study stresses that overreliance, ethical concerns, and issues of training are included. Any effective integration of AI has to balance out technological innovation with the human aspects of teaching to make sure that AI complements rather than replaces teachers. If it does so, comprehensive training programs and further long-term research on the effect of AI on education will be needed.

Conclusion

The integration of AI into education is an area of equal promise and challenge. Generally, pre-service teachers recognize the potential of AI in enhancing student engagement and personalization of learning experiences, yet valid concerns relate to overreliance on technology, ethical implications, and the need for proper training. Discrepancies in perceptions from the research findings indicate a dire need for an enhanced AI training program in teacher education, ethical guidelines concerning the use of AI in educational settings, and strategies to ensure that AI enhances and does not replace the human elements of teaching.

Recommendations

Based on the findings of the study, the following recommendations were made:

1. Comprehensive AI literacy courses in schools should be developed and implemented within the teacher preparation curricula.
2. For proper implementation, there is a need for the government to set up and implement effective ethical structures regarding how AI can be used in schools, while keeping a keen eye toward data privacy and security.
3. Policy makers/stakeholders should also develop strategies and best practices to use AI in order to enhance, not replace, human contact in the classroom.

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STRATEGIES FOR PROMOTING QUALITY ASSURANCE IN TEACHING AND LEARNING TECHNICAL AND VOCATIONAL EDUCATION AND TRAINING (TVET) FOR NATIONAL DEVELOPMENT IN NIGERIA

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ABSTRACT

Development a robust Quality Assurance (QA) framework in Technical and Vocational Education and Training (TVET) is significant for fostering national development in Nigeria. This paper explores the importance of implementing comprehensive QA mechanisms and strategies to enhance the effectiveness of TVET programmes. By aligning educational outcomes with industry standards, these strategies can improve the employability of graduates and ensure that TVET contributes meaningfully to national development. Similarly, the paper identifies key barriers to effective QA implementation, including resource constraints, weak policy frameworks, institutional resistance, and corruption and unethical practices. Addressing these challenges is vital for the successful delivery of high-quality TVET education that meets both local and global labour market demands. The paper concludes that strengthening QA in Nigeria's TVET sector is crucial for achieving the country's development goals. By producing a skilled and competent workforce, TVET can play a pivotal role in promoting sustainable development and ultimately positioning Nigeria more competitively on the global stage. The paper recommended that QA mechanisms in TVET sector should be strengthen to ensure that the education and training provided are relevant, efficient, and capable of meeting the demands of both the local and global labour markets, technology-enhanced learning tools should be integrated into instruction delivery to assist the educators to design learning activities, prepare materials and develop instructional content that will equip the learners with requisite competencies and make them active players in global market, among others.

Keywords: TVET, Quality assurance & National development

Introduction

Globally, Technical and Vocational Education and Training (TVET) is increasingly recognized as a critical ingredient of national development, particularly in countries striving to achieve sustainable economic growth and social equity. In Nigeria, TVET is crucial in equipping individuals with the skills, knowledge, and requisite competencies needed to

contribute effectively to the labour market and the broader economy. Smith and Blake, (2023) conceived TVET is an educational approach that emphasizes the development of practical skills and technical knowledge required for specific jobs and industries, which aimed to prepare recipients for direct entry into the workforce by providing hands-on training and industry-relevant education that can take place in various settings such as vocational schools, community colleges, and apprenticeship programmes. However, despite its (TVET) importance, the quality of graduates from TVET institutions in Nigeria has been a subject of concern as a result of skills gap for industry needs. Evidences from literatures (Oviawe, 2022; Okoye & Okwelle, 2017) revealed that many TVET graduates lack the requisite technical competencies, leading to unemployment or underemployment, which could be due to inadequate infrastructure to outdated curricula, insufficient teacher training, and weak industry linkages, hence the need to query the quality assurance mechanisms being employed in TVET institutions.

Quality assurance (QA) implies a systematic review of educational provisions to maintain and improve the quality, equity and efficiency on education. The QA mechanisms in TVET are vital in ensuring that the education and training provided in our TVET institutions are relevant, efficient, and capable of meeting the demands of both the local and global labour markets. Effective QA systems assist in maintaining and improving educational standards by monitoring, evaluating, and enhancing the processes involved in teaching and learning. Evidence from literature (Nyonasenze et al, 2025; World Bank, 2022 & UNESCO, 2015) stressed the importance of QA in TVET, include; enhancement of training quality, enhanced employability of graduates, boosting the reputation and credibility of TVET institutions and programmes among others. However, Oviawe, (2018) observed that in Nigeria, the QA mechanisms within TVET institutions are often inadequate, which often impede the overall effectiveness of these institutions in contributing to national development.

National development refers to the capacity of a nation to enhance the standard of living of its citizens. It involves enhancing the quality of life for citizens through sustainable economic growth, poverty reduction, and equitable access to education, healthcare, and infrastructure. Eboh and Okezie, (2022) stressed that national development requires the integration of policies that foster human capital development, technological innovation, and industrialization. United Nations Development Programme (UNDP), (2023) stressed that national development is a multifaceted concept referring to the process of improving the economic and social well-being of a country's population. This includes reducing poverty, increasing access to education and healthcare, and ensuring sustainable growth that benefits everyone. According to Akinbode, (2022) effective TVET frameworks support national development through improved workforce competencies, which are essential for industrialization and technological advancement. Therefore, enhancing QA in TVET is essential for realizing Nigeria’s national development goals. By addressing the existing challenges and implementing effective QA mechanisms, Nigeria can ensure that its TVET sector will produce a skilled workforce capable of meeting the demands of the modern economy.

Literature Review

Quality Assurance

Quality assurance (QA) is conceived as a systematic review of educational provisions and policies for the purpose of improving its quality, equity and efficiency. In context, UNESCO, (2020) described quality assurance as systematic processes and activities aimed at ensuring that TVET programmes meet the required standards, are relevant to the needs of the labour market, and provide learners with the knowledge, skills, and competencies necessary for employment and further learning. Kafyulilo et al, (2023) emphasized that robust QA frameworks can significantly improve teaching and learning outcomes by establishing clear standards and regular evaluations. Evidence from literature (Aliyu and Ibrahim

2022) stressed the role of continuous professional development for educators in maintaining quality standards, arguing that ongoing training is essential for adapting to technological advancements and industry needs.

Quality assurance (QA) plays a crucial role in TVET by ensuring educational programmes are in tune with industry standards and in consonance with global best practices. Johnson and Smith (2022) observed that effective QA practices involve stakeholders in the evaluation process, ensuring that training interventions align with labour market requirements and emerging industry trends. The QA not only supports the continuous improvement of teaching pedagogies but also fosters institutional transparency and trust among the stakeholders in educational enterprise (Patel & Kumar, 2024).

Technical and Vocational Education and Training

Technical and Vocational Education and Training (TVET) encompass a range of learning experiences that prepare individuals for employment in specific trades or occupations. According to UNESCO-UNIVOC, (2023) TVET refers to education and training programmes that provide learners with the practical skills, knowledge, and attitudes necessary for employment in specific occupations or industries. The main thrust of TVET is to equip individuals with the competencies required for employment, entrepreneurship, and further learning. TVET programmes often integrate classroom instruction with hands-on experience; preparing learners for the demands of the workforce. The holistic approach of this programme ensures graduates are not only equipped with technical skills but also possess problem-solving abilities and adaptability crucial for success in diverse work environments.

However, the objectives of TVET as enshrined in the revised National Policy on Education (2015) include:

(a) to provide trained man power in applied science, technology and commerce particularly at sub-professional grades.

(b) to provide the technical knowledge and vocational skills neccesary for agriculture, industrial, commercial and economic development.

(c) to provide people who can applied scientific knowledge to the improvement of, and solution to environmental problems for the use and convienience of man.

(d) to give training and impact the neccesary skills leading to the production of craftmen, technicians and other skilled personnel who will be enterprising and self-reliant.

(e) to enable our youngmen and women to have an intelligent undrestanding of the increasing complexity of technology.

A careful look at the objectives of TVET stated above revealed that the programme is based on productivity by equipping an individual with essential skills for survival in the world of work. However, Since, a country's education depends on the needs and aspiration of the country, therefore, there should be a paradigm shift in TVET curriculum from a provider-driven training model, where students receive training without the assurance that the training is aligned to an identified need in the labour market, to a demand – driven training model whereby the curriculum is designed to address a gap observed in the labour market. With this, graduates can be equipped with entrepreneurial skills from the various trade areas available in TVET and hence become competent job – creators rather than job – seekers after graduation. This will eventually assist in improving their (graduates) standard of living or the condition of living of their dependents, alleviate poverty, improves the security of lives and property and also contribute to national development.

National Development

Development in human society is a complex multi-dimensional phenomenon and means different things in different

societies in different situations and to different thinkers. According to Obinna, (2022) national development encompasses holistic advancement that includes structural changes in economic, social, and political systems. This view emphasizes the need for comprehensive reforms to achieve sustainable development and equitable growth. It goes beyond economic growth to encompass aspects such as health, education, gender equality, and political participation. At the society level, development is associated with modernization, material advancement, industrialization, scientific and industrial progress, new knowledge about man and the universal improvement in standard of living, decrease in loss of lives and social security management towards racial, tribal and gender equality, decrease in unemployment and availability of job opportunities. To buttress the aforementioned about national development, The World Bank, (2021) submitted that TVET plays a pivotal role in national development by fostering economic growth and reducing unemployment, firstly, TVET equips individuals with practical skills and competencies tailored to meet industry demands, thereby enhancing workforce productivity. By providing training that aligns with current labour market needs, TVET helps to bridge the skills gap, ensuring that industries have access to a pool of skilled workforce essential for innovation and economic progress. Therefore, enhancing quality assurance in implementing TVET policies ensures graduates are employable and can compete favourably in global market, and thus contribute to national development.

Strategies for Ensuring Quality Assurance Framework in Technical and Vocational Education and Training in Nigeria

Implementing a robust Quality Assurance (QA) framework in Technical and Vocational Education and Training (TVET) is essential for ensuring the delivery of high-quality education that meets industry standards and prepares students for the workforce. Impactful strategies for implementing QA in TVET incorporate a wide range of approaches, including the adoption of standardized assessment tools, regular curriculum reviews, continuous professional development for educators, fostering strong partnerships with industry stakeholders, integrating technology-enhanced learning tools, among others are essential for aligning educational outcomes with labour market demands, thereby enhancing the overall effectiveness and credibility of TVET programmes. Some of the strategies are briefly discussed below:

Standardized Assessment Tools and Programme Evaluations: Implementing standardized assessment tools and conducting regular programme evaluations are crucial for maintaining consistent quality standards across TVET institutions. Standardized assessment tools and programme evaluations ensure consistent quality across TVET institutions by benchmarking educational outcomes and regularly assessing programme effectiveness (Ogunleye & Ojo, 2023). In implementing this for instance, the TVET institutions can adopt standardized trade tests and skill certification exams such as National Skills Certification and Assessment Programmes (NSCAP) developed by bodies like the National Board for Technical Education (NBTE) or National Business and Technical Examinations Board (NABTEB). These exams can be employed to assess students' competencies based on national occupational standards. This can assists to verify the readiness of graduates for industry needs, and results obtained can provide a guide for curriculum review and staff development programmes.

Periodic Curriculum Refinement and Update: This implies regular review and updating curriculum to ensure relevance and effectiveness in addressing societal needs. Ogunmodede and Olarinde (2024) opined that periodic reviewing and updating the curriculum ensure that it remains relevant to current industry standards and practices, thus enhancing the employability of graduates. For instance, in implementing this strategy, TVET institutions can organize annual curriculum review workshop where representatives from industries, policymakers, instructors and other stakeholders collaborate for the purpose of evaluating the relevance of existing courses, recommend new emerging skills, and thus keeping training

programmes in tune with the evolving labour market demands.

Continuous Professional Development for Educators: This refers to ongoing learning and training activities that TVET instructors engage in for the purpose of enhancing their skills, knowledge, and effectiveness in the classroom. Okonkwo and Eze (2022) observed that providing ongoing training for instructors in the latest pedagogical and technological methods is essential for upholding QA standards and improving instructional quality. In implementing this strategy, The TVET institutions for instance can initiate a structured, mandatory Continuous Professional Development (CPD) programme for TVET instructors/educators. These could be by participating in quarterly workshops, skill-upgrading courses, relevant industry attachment schemes and other training programmes that are directly tied to quality assurance benchmarks.

Adoption of Technology-Enhanced Learning Tools: These are digital or electronic resources that can assist educators to design learning activities, prepare learning materials and develop instructional content for engaging the learners. Literature (Smith & Jones, (2023) revealed that Technology-Enhanced Learning Tools in TVET have shown significant potential to improve learning outcomes by providing interactive learning, flexible educational experiences, bridging skills gaps, enhancing practical training, and promoting accessibility to learning. In realizing this strategy, TVET institutions can introduce a blended learning system that integrates traditional hands-on workshops with technology-enhanced learning tools such as virtual simulations, e-learning platforms, and mobile learning applications. These learning modes Standardize content delivery and assessment across different instructors, allows remote appraisal of teaching effectiveness and students' participation and also bridges the gap between emerging industry practices and training in TVET institutions.

Stakeholders Feedback Mechanisms: These are processes or methods used in collecting and receiving input, opinions or reactions from individual or interest group for improving decision-making, performance or outcomes of a programme. Musa and Akinyele, (2023) asserted that developing effective feedback mechanisms from students, employers, and other stakeholders helps in identifying gaps in training programmes and making necessary improvements. In realizing this strategy, TVET institutions can create a formal and regular feedback system that gathers input from students, employers, alumni, parents, industry partners and other stakeholders to continuously improve training quality and maintain high standards.

Regular Accreditation and Certification Processes: These refer to periodic or regular processes of evaluating, verifying, recognizing and validating an institution or programme to ensure adherence to standards or requirements. Aliyu and Bamidele (2023) observed that establishing regular accreditation and certification processes ensures that TVET programmes meet national and international standards, enhancing their credibility and effectiveness. This strategy can be practically implemented through the establishment of a structured and periodic system of internal and external assessment by TVET institutions to ascertain the compliance of the institutions' programmes using quality indicators by accreditation bodies such as NBTE, NABTEB, NCCE and other accreditation bodies. Periodic accreditation cycle ensure continuous programmes' quality improvement in all teaching resources, records, physical facilities, staff qualification, student-teacher ratio, workshop/Laboratory adequacy, curriculum relevance, student academic performance, among others.

However, to ensure quality assurance in TVET, continuous evaluation and programmes' alignment with industry standards are crucial. Strengthening the teachers through continuous professional development, fostering collaboration between institutions and industry experts, among others will keep curricula relevant and in tune with global advancements.

Also, integrating technology-enhanced learning through digital or electronic resources will assist the educators to design learning activities, prepare materials and develop instructional content that will equip the learners with requisite competencies that will make them active players in the global market.

Barriers to Effective Quality Assurance Framework Implementation in Nigeria

Implementation of an effective QA framework in TVET has suffered a lot of setbacks. These challenges had made the realization of quality assurance plans on TVET programme difficult to achieve. Some of these barriers include;

Resources and Infrastructure Constraint: The TVET programmes are capital intensive, as a result, TVET institutions are often confronted with challenges related to insufficient funding and poor infrastructure. Ibrahim, (2023) asserted that this lack of resources can impede the establishment of quality assurance mechanisms and the maintenance of training facilities. Therefore, the TVET institutions should invest in procurement of modern and well-equipped facilities to facilitate hands-on practical training. In addition, the students should be allowed access to up-to-date textbooks, software, and equipment that reflect the emerging industry needs and standards.

Insufficient Training for Teachers: Quality assurance practices required some form of training for effective implementation. Ojo and Afolabi, (2023) posited that many TVET educators lack specialized training in quality assurance practices. This shortfall in skills and knowledge affects their ability to implement and monitor quality standards effectively. Hence, regular continuous professional development (CPD) workshops, seminars, and refresher courses specifically focused on QA practices should be organized for the TVET educators to ensure that teachers are updated with the latest standards, tools, and procedures in quality assurance.

Weak Policy Frameworks: The regulatory and policy blueprint governing TVET quality assurance are often inadequate or poorly enforced. Eze and Oladipo, (2024) submitted that this weak regulatory structure results to inconsistent application of quality standards. Therefore, there is need for constant review, update, and harmonization of the existing QA-related policies to ensure clarity, consistency, and alignment with international best practices. Constant reform and unification of policy framework will provide a solid foundation for effective QA implementation and reduce overlaps and contradictions in directives.

Corruption and Unethical Practices: Corruption and unethical conducts among TVET administrators and instructors in Nigeria undermine the effectiveness of quality assurance guidelines (Adebayo, 2022). Therefore, initiate clear, enforceable accountability systems such as regular audits, anonymous reporting channels, and performance tracking tools. Transparent processes and accountability measures reduce opportunities for malpractice and build trust in the QA system.

Cultural and Institutional Resistance: People naturally often show apathy to change. Ibrahim, (2023) observed that there is often resistance within institutions towards adopting new quality assurance practices due to entrenched cultural attitudes and administrative bureaucracy. Resistance or apathy often stems from misunderstanding or fear of change, therefore, regular conduct of sensitization conferences, workshops, and advocacy campaigns to enlighten stakeholders, especially school heads, instructors, and administrators, on the significance and benefits of QA practices. Regular sensitization among the stakeholders will promote a positive attitude, dispels misconceptions, and builds proprietorship of the QA process.

Therefore, overcoming the challenges of effective QA framework implementation in TVET is essential for ensuring the delivery of high-quality education and training. Addressing these barriers require strategic investment in infrastructure,

development of standardized guidelines, training of personnel in quality assurance practices, dealing with corruption and unethical practices, among others, so that TVET institutions can better fulfill their mandate in producing skilled graduates, thereby contributing to national development and economic growth.

Conclusion

Technical and Vocational Education and Training (TVET) plays a pivotal role in Nigeria's national development by equipping individuals with essential skills required in the labour market. However, challenges such as weak policy frameworks, inadequate infrastructure, and insufficient teacher training impede the effectiveness of TVET programmes. Addressing these issues require robust Quality Assurance (QA) mechanisms and strategies including: Implementing regular curriculum refinements, continuous professional development for educators and integrating technology-enhanced learning can significantly improve the quality of education provided. Therefore, promoting QA in Nigeria's TVET institutions is critical for achieving national development goals by ensuring that TVET graduates possess the necessary skills and competencies will improve their employability and also contribute to national development. However, this study can provide evidence-based strategies that inform policymakers and educational authorities on how to structure and implement effective quality assurance systems within TVET institutions. Another area of contribution of this paper is that it emphasizes how high-quality TVET can contribute to economic growth, poverty reduction, and workforce development. Meanwhile, areas of further research in line with this review can include: Impact of Quality Assurance Mechanisms on Graduate Employability in TVET. The focus will be to investigate how specific QA practices - e.g., curriculum reviews, assessment standards, accreditation processes among others affect the employability and workplace performance of TVET graduates. In addition, another area of future research can be Role of Digital Tools in Fostering Quality Assurance in TVET Instruction Delivery. The emphasis here will be to examine the effectiveness of digital platforms, e-learning tools, and data management systems in strengthening QA processes in TVET institutions.

Recommendations

In the light of the issues discussed in the paper, the following recommendations are drawn:

The QA mechanisms in TVET sector should be strengthen to ensure that the education and training provided are relevant, efficient, and capable of meeting the demands of both the local and global labour markets.

The pedagogies employed in implementing curriculum in TVET institutions should equip the recipients with practical skills and competencies tailored to meet industry demands.

Technology-enhanced learning tools should be integrated into instruction delivery to assist the TVET educators to design learning activities, prepare materials and develop instructional content that will equip the learners with requisite competencies that will make them active players in global market.

TVET programmes are capital intensive, therefore more funding should be allotted to ensure smooth running of the programmes in line with global best practices.

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GENDER DIFFERENCES AND TOBACCO SMOKING BEHAVIOUR AMONG UNDERGRADUATES OF THE UNIVERSITY OF LAGOS, NIGERIA

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ABSTRACT

Tobacco smoking remains a significant public health concern, particularly among young adults. Research indicates a rising trend in tobacco use, with projections showing it could account for 18% and 11% of all deaths in developed and developing countries, respectively, by 2020. Despite numerous studies on tobacco use, limited research focuses specifically on smoking behaviours among university undergraduates. This study explored gender differences in tobacco smoking among students at the University of Lagos, Nigeria. A cross-sectional survey design was employed, using stratified random sampling to select male and female students from each faculty. A total of 1,521 undergraduates participated. Data collection involved questionnaires and six Focus Group Discussions (FGDs) with both smokers and non-smokers. Four hypotheses were tested at a 0.05 significance level using t-tests, ANOVA, and content analysis. Findings revealed significant gender and age-related differences in knowledge of tobacco's health risks. Male students smoked more frequently than females, and those aged 15–19 were more likely to smoke than older peers. Attitudes toward smoking also varied significantly by gender. FGDs indicated that female students were generally more aware of the health dangers of smoking than males. The study underscores the need for targeted health education and smoking cessation programs, particularly among male students and younger age groups. Enhancing awareness of tobacco's health consequences is essential for promoting healthier lifestyles among undergraduates at the University of Lagos.

Keywords: Tobacco smoking behaviour, Health problems, University of Lagos students and Gender differences

Introduction

Globally, the enrollment rate of students into the institutions of higher learning is on the increase, particularly at the university levels. As a result, young adults continue to be vulnerable to unhealthy lifestyles, because of the belief that campus life is characterized by freedom. Some of these young people engage in harmful habits which are; smoking,

alcoholism, unhealthy sexual behaviours, abortion, unwanted pregnancy, absenteeism, smuggling of prepared answer scripts into the examination halls, fighting in the halls of residence and of course carrying aristos and aristoreses. They engage in all these without considering the inherent dangers and health problems. Smoking therefore is one of the major contributing factors to peoples' ill-health and sudden death. Guidon (2003) affirmed that as at year 2000, smoking was practiced by 1.2 billion people. He stressed further that, if no change in prevalence, it is therefore predicted that 1.4 billion would smoke in 2010 and 1.5 to 1.9 billion in 2025.

Going by the above assertions, tobacco smoking can then he seen as a health problem inducing habit that many young adults engage in, with respect to university undergraduates. Smoking is generally five times higher in males than female students. World Health Organization (2001) noted that in developed countries, smoking rates for men have been peaked and have begun to decline. At the University of Lagos, where this study was conducted, it was found out that the attitude of female students towards tobacco smoking is significantly better than that of their male counterparts ($p < 0.05$). However, in the opinion of Moronkola and Akinterinwa (2003), who submitted that only 16.7% of their students' respondents had attitude which does not favour tobacco smoking. They went further that although, there was no significant gender difference in the attitude of students towards tobacco smoking.

One of the reasons for tobacco smoking prevalence in the world today is, its availability and this is so disheartening that even the very younger boy of 2 and girl of 3 do smoke 40 sticks at a go like no man business. According to a report by Centre for Non-Communicable Diseases (2011) that the situation is not helped by the fact that tobacco smoking habit is on an upward swing. It continued that, World Health Organization and Non-Governmental Organizations came to a conclusion that government must promote more public awareness of the harmful effects of smoking, enforce the law prohibiting smoking in public places and ensure availability and affordability of treatment options for tobacco dependence.

Many smokers do engage in smoking activities, particularly the Undergraduates of the University of Lagos who gave reasons for their action during Focus Group Discussion sessions that some of them smoke to enhance their academic morale and performances when studying for examinations, tests and some said they smoke whenever they are lonely while to some, no reason for their action. Wiki (2011) affirmed that reasons given by smokers are: addictive smoking, pleasure from smoking, tension reduction or relaxation, social smoking, stimulation, habit/automatism and handling.

There are gender differences in how much each of these reasons contributes, with females more likely than males to cite tension reduction/relaxation, stimulation and social smoking. Though, the gender gap declines with younger age. Gender and sec are often used interchangeably, though sender is more encompassing. Gender is about the societal ascribed roles, behaviours, or pattern of ways of life associated with being a male or female sex. In Nigeria, most students in higher institutions engage in character damaging and unhealthy behaviours as a result of their immaturity. Moronkola (2002), said that the concept of health behaviour is important to both health education and health promotion and it is justifiable to explain in concise form what is health behaviour as it is not easy, to define it. Health education is concerned with changing behaviour and that there is need to know what people think, what they believe and what they do later in life. There is a need to find out why they think, believe, and do as they do.

Nature of Tobacco Smokıng

Tobacco smoking is the practice where tobacco is burned and the resulting smoke is inhaled. Tobacco is the most common substance smoked among undergraduates particularly at the University of Lagos. In 2011, the University authority ordered

security operatives to chase out all the food vendors in hall of residence as a result of the information given by people that some of the students use cafeteria to perpetrate evil, especially smokers. Smoking is the most common method of consuming tobacco, and tobacco is the most common substance smoked. In a study by WHO & CDC (2001) that as at 2000, smoking was practiced by approximately 1.22 billion people. They went further that in most communities, men are more likely to smoke than women, though the gender gap tends to be less pronounced in lower age groups. Most smokers begin during adolescence or early adulthood. During the early stages, a combination of perceived pleasure acting as positive reinforcement and desire to respond to peer pressure may offset the unpleasant symptoms of initial use, which typically include nausea and interrupted sleep patterns. After an individual has smoked for some years, the avoidance of withdrawal symptoms and negative reinforcement become the key motivations to continue

Types of Tobacco

According to Wingand (2006) who identified and explained types of tobacco as follows: Cigars, Cigarettes, Electronic cigarette, French inhale, Hookah and Kretek. Cigars are tightly rolled bundles of dried and fermented tobacco which are ignited so that smoke may be drawn into the smoker's mouth. They are generally not inhaled because the high alkalinity of the smoke, which can quickly become irritating to the trachea and lungs and the prevalence of cigar smoking varies depending on location, historical period, and population surveyed, and prevalence estimates vary somewhat depending on the survey method. *Cigarettes* french for "small cigar", are a product consumed through smoking and manufactured out of cured and finely cut tobacco leaves and reconstituted tobacco, often combined with other additives, which are then rolled or stuffed into a paper-wrapped cylinder. Cigarettes are ignited and inhaled, usually through a cellulose acetate filter, into the mouth and lungs. Electronic cigarettes are alternative to tobacco smoking, although no tobacco is consumed. It is a battery-powered device that provides inhaled doses of nicotine by delivering a vaporized propylene glycol/nicotine solution. Many legislation and public health investigations are currently pending in many countries due to its relatively recent emergence and most electronic cigarettes are designed to resemble actual tobacco smoking implements, such as cigarettes, cigars, or pipes, but many take the form of ballpoint pens or screwdrivers since those designs are more practical to house the mechanisms involved. Most are also reusable, with replaceable and refillable parts, but some models are disposable. The French inhale is the action performed by smokers of expelling smoke from the mouth and inhaling it into the nostrils.

Hookah are a single or multi-stemmed (often glass-based) water pipe for smoking. Originally from India the hookah was a symbol of pride and honour for the landlords, kings and other high class people. Now, the hookah has gained immense popularity, especially in the Middle East. A hookah operates by water filtration and indirect heat. It can be used for smoking herbal fruits, tobacco, or cannabis. *Kretek* are cigarettes made with a complex blend of tobacco, cloves and a flavoring "sauce". It was first introduced in the 1880s in Kudus, Java, to deliver the medicinal eugenol of cloves to the lungs. The quality and variety of tobacco play an important role in kretek production, from which kretek can contain more than 30 types of tobacco. Minced dried clove buds weighing about 1/3 of the tobacco blend are added to add flavoring.

Health Consequences of Tobacco Smokıng

The health consequences of tobacco are primarily factors leading to the most commonly diseases affecting the heart and lungs with smoking being a major risk factor for heart attacks, strokes, chronic obstructive pulmonary disease (COPD). American Heart Foundation (2012) viewed that tobacco use leads to diseases which affect the heart and lungs and will mostly affect areas such as hands or feet with first signs of smoking related health issues showing up as numbers. There

are major health consequences of tobacco smoking; cancer of various parts of the body, hypertension, respiratory diseases, effect on pregnancy, fire hazards, body odour/social health.

Cancer of Varıous Parts of the Body

The primary risks of tobacco use include many forms of cancer, particularly lung cancer, kidney cancer, cancer of the larynx, head cancer, neck cancer, breast cancer, bladder cancer, cancer of the pancreas, stomach cancer, cancer of the oesophagus, cancer of the gull bladder, cancer of the adrenal gland, cancer of the small intestine, liver cancer, colorector cancer, myeloid leukaemia, suamous cell sinonasal cancer and many more childhood cancers. Studies have shown a stronger relationship between tobacco smoke including second hand smoke and cervical cancer in women. Thun (2008) affirmed that, the risk of dying from lung cancer before age 85 is 22.1% for male smokers and 11.9% for female smokers

Respiratory diseases

Smoking harms nearly every organ of the human body. The adverse effects from smoking account for a very large number of deaths across the world. Smoking affects the respiratory system. It is important to have a basic knowledge of the components that make up this system. A human system basically consists of a nasal passage, pharynx in the coat, trachea or the wind pipe, bronchi and alveoli (they reside in the lungs). Apart from diseases associated with tobacco smoking, other health effects are: infertility, preterm delivery, still birth, low birth weight, sudden infant death syndrome (SIDS), low bone density, increased risk for hip fracture

Why young People Smoke Tobacco

There are many reasons for tobacco use and other psychoactive substances by youths and likely that prior to the actual use they engage in an evaluation process which ends in their decision to smoke or not. In a study by Moronkola (2006) that empirical research and opinions from other researchers had shown that among in-school adolescents, the influence of fellow students, friends and peers, relaxation to suppress frustration and cope with the task were more popular reasons for tobacco smoking. Considering these opinions, it could however be said that why people smoke are to study hard, work hard, escape from reality, imitate models, feel high, being lonely, being curious, influence by peers and available in the market and advertisement.

Prevalence of Tobacco Smokıng among Young People ın Nıgerıa

It has been observed that millions of youth, especially students in higher institutions take delight in tobacco smoking not minding the inherent dangers. Some of these age groups try cigarette smoking and later move to tobacco smoking, despite all the interventions by the governmental and non-governmental agencies. Pelling (2006) quoting Geldald & Geldard (1999) that many influences come to play on a youth's decision to use tobacco or not and may include personal factors, role models, peer influences, advertisements, and available information on smoking and tobacco. Smoking prevalence has changed little since the mid 1990's until which time it declined in English-speaking countries which have all implemented tobacco control. Guindon and Boisclair (2003) predicted that 1.5 to 1.9 billion people would be smokers by the year 2025, particularly the young adults.

WHO (2004) however, projected that 58.8mllion deaths will occur globally result of active smoking by youths and from which 5.4 millions are tobacco consumption is now globally reported among all age groups. This has led to extensive studies by various researchers. Countries where tobacco smoking take higher prevalence are: Argentina, Australia, Canada, People's Republic of China, Colombia, Ecuador, Egypt, England, Finland, France, Germany, Greece, Hong

Kong, Iceland, Indonesia, Ireland, Italy, Japan, Pakistan, South Korea, Macao, Malaysia, New Zealand, Nigeria, Norway, Singapore, Sweden, Syria, Taiwan (Republic of China), Turkey, Uruguay and United States of America. According to United Nations Population Division (2000) that all youths from zero to fourteen (0 -14) would smoke actively by 2025 and 2050 respectively, unless urgent action is taken to curb it. Prevalence of smoking habit among people even teenagers is on the increase. According to Adelusi (2012), who reported that two hundred kids live and learn to smoke Indian hemp. The report showed that the rate at which youths engage in substance abuse is increasing on daily basis. It is high time that governments at all levels across the globe should begin propagating tobacco education and smoking cessation to the young ones, particularly students of higher institutions, since they believe that life is characterized by freedom.

Concept of Gender and Gender Dıfferences

Gender as a concept refers to the assigned specific roles, values and expected behaviour given by a society to individuals because they are male or female. Gender is a multifaceted construct, and composed of social roles, behaviours, values, attitudes, social environmental factors, as well as biological, physical, and hormonal attributes. Yet, the term gender and sex are often used interchangeably. Scholars are of the opinion that social support influences health status, health behaviour, and use of health services. There are a number of gender attitudes and values that profoundly influence health, for example, the meaning individuals attach to health is likely to affects their general health satisfaction, interaction (or lack thereof) with health professionals, and the use of alternative health services (Pitman, 1999). Gender differences in symptoms perception versus actual symptomatology, although difficult to distinguish, may partially explain sex differences in health (Gijsbers -Van Wijk and Kolk, 1997). Several factors linked to gender, include vulnerability to violence, care given burden, nialadaptive health practices and influence of health related behaviours.

Tobacco Smokıng Behavıour Among Young People

Health behaviour may change from time to time due to several factors like age or gender. It is essential to have good health behaviour. At-risk health behaviour, as such behaviour that may put an individual and/or others, at negative health outcomes. Such behaviours among university students include tobacco smoking, alcohol abuse, psychoactive use, premarital sexual behaviour, negative nutritional behaviour, poor physical activities and so on. Smoking is one of the instant contributory factors to people's ill health and sudden death. Moronkola (2001) said that health risk behaviours are the decisions, actions and conditions of living like drug misuse and abuse, feeding habit, smoking, premarital and extra-marital sex which may be self imposed or imposed by socioeconomic condition that all affect one's health status.

Prolonged smoking is a leading behavioural cause of premature mortality and disability, resulting in approximately four million deaths annually worldwide (WHO, 1999). Although smoking kills more people than AIDS, alcohol, drug abuse, car crashes, murders, suicide and fire combined each year (Center for Disease Control and Prevention, 2001). It stresses further that approximately one-third of the global young adult population, or 1.1 billion people, have chosen to smoke. This astonishing figure includes many young and school-aged users. In the United States 80% adult smokers started smoking before the age of 18 years .Nearly 3000 young people in the same age-bracket become regular smokers everyday (CDC, 2001). Regarding tobacco use behaviours among college students, the 1995 National College Health Risk Behaviour Survey provides the most recent, representative and comprehensive research results to date (Douglas, et.al, 1997). These results showed that, early three-quarters (74.8%) of the college use almost one-third (31.3) had smoked at least one cigarette every day for at least 30 days lifetime daily cigarette use.

Werner and Sharon (2000), postulated that smoking prompt the release of nicotine and some other 1, 200 toxic compounds

into the blood stream. More than 47 million adults and 3.5 million young people smoke cigarette. Smoking however, is the single largest preventable cause of illness and premature death. Smoking has been linked to cardiovascular disease, cancer, bronchitis, emphysema and peptic ulcers. About one in three or 1.1 billion people worldwide smoke. By 2020, tobacco use will cause about 18% and 11% of all deaths in the developed and developing countries (WHO, 2004). Tobacco use is a known cause of about 25 diseases including heart disease, cancer, stroke and chronic obstructive pulmonary disease. Smokeless tobacco use causes oral cancer in the lip, tongue, mouth and throat areas and digestive system cancers. Most people who use tobacco initialize it prior to age 18 and their exposure can aggravate allergies and there could also be an increase of some effects in children and adolescent with asthma and heart disease.

Methodology

The study was conducted at University of Lagos, Nigeria using undergraduates of the institution as sample for the study. Students' statistics were obtained from the academic planning unit. Out of a total number of 17,954 (10, 495 male and 7,495 female undergraduates); 10% of male and female students from each faculty was sampled. However, one thousand five hundred and twenty one (1,521) participants eventually filled and returned the questionnaire forms. The instrument used for collecting data from the participants was a self-developed questionnaire which had four sub-scales: knowledge of young people on tobacco smoking (r0.82), attitude of young people towards tobacco smoking (r=0.64), determinants of smoking behavior of young people (r=O.86) and smoking behavior of young people (r0.70). The questionnaire was complemented with six Focus Group Discussion sessions with both smoking and non-smoking undergraduates. Four hypotheses were tested at 0.05 level of significance. Data were analysed using t-test, Analysis of Variance and content analysis. Prior to this study, a pilot study was carried out on eighteen (18) undergraduates of the Lagos State University, Ojo (LASU) which yielded 0.75. Cross-sectional descriptive survey research design was used for the study. Stratified random sampling technique was used to divide the students into male and female while simple random sampling technique was also used to pick the participants in each of the faculties.

Results

Participants' demographic variables

The results are shown through providing demographic variables of the participants.

Table 1. Sex and Age distributions of the participants

Variables	Frequency	Percentage (%)
Sex		
Male	987	65
Female	534	35
Total	1521	100.0
Age Group		
15-l9yrs	498	33
20-24yrs	628	41
25-29 yrs	232	15
30 yrs and above	163	11
Total	1521	100.0

Table 1. presents the demographic characteristics of the participants. In terms of sex distribution, table 1. revealed that 987 (65%) of the participants were male and 534 (35%) were female. This implies that there were more male participants than female participants. Also table 1. showed that 33% of the participants were in 15 to 19 years age range, 41% of the participants were 20 to 24 years. And 15% of the participants were 25 to 29 years and 11% of the participants were 30

years and above.

Table 2: Results of The Statıstıcal Analysıs

	Differences in knowledge of health consequences on tobacco smoking between male and female undergraduates of university of Lagos	Differences in the attitude of male and female undergraduates of university of Lagos towards tobacco smoking.	Differences in tobacco smoking behaviour of male and female undergraduates of university of Lagos	Age difference in of tobacco smoking behaviour among university of Lagos undergraduates .
t-test	2.23	2.52	1.95	f. value 26.65
df	1519	1519	1519	3
Asymp. Sig.	0.02	0.01	0.05	0.00

Table 3: Hypotheses Testing

Age Group (I)	Age Group (II)	Mean Difference	Sig P
15—l9yrs	20—24yrs	1.18*	0.00
	25 — 29yrs	2.07*	0.00
	30yrs and above	3.06*	0.00
20— 24yrs	25 — 29yrs	0.89	0.06
	30 yrs and above	1.88*	0.00
25 — 29yrs	30yrs and above	099	0.16

The table above showed that undergraduates within 15 - I 9years have significant attitude toward tobacco smoking than those within 20 - 24 years, those within 25 - 29 years and those who are year- old and above. Similarly, undergraduates within 20 - 24 year- old have significant attitude toward tobacco smoking than those within 30 year- old and above.

Hypothesis 1 -

The t value of 2.23 is significant at 5% (P<0.05). The hypothesis which stated that there will be no significant gender differences in knowledge of health consequences of tobacco smoking between male and female undergraduates of the University of Lagos is hereby jettisoned.

Hypothesis 2

The t value to 2.52 is significant at 5% (P<0.05). The hypothesis which stated that there will be no significant gender differences in the attitude of male and female undergraduates of university of Lagos towards tobacco smoking is hereby jettisoned.

Hypothesis 3

The t value of 1.95 is significant at 5% (P<0.05). The hypothesis which stated that there will be no significant gender difference in tobacco smoking behavior of male and female undergraduates of university of Lagos is hereby jettisoned. It is therefore concluded that female students had better knowledge of tobacco smoking compared to their male counterparts.

Hypothesis 4

The f value of 26.65 is significant at 5% (P<0.05). The hypothesis which stated that there will, be no significant age difference in behaviour of tobacco smoking among undergraduates of university of Lagos is therefore jettisoned.

Dıscussıon of Fındıngs

This implies that female students have significant better knowledge about health consequences of tobacco smoking than

male students. Moronkola and Akinterinwa (2003) corroborated this in their study that there was a significant gender difference in knowledge of health consequences of tobacco smoking in favour of male. Salawu, Danburam, Desalu, Olokoba, Agbo and Midala (2009) who supported the above that female students had significant knowledge of health consequences than their male counterparts to tobacco smoking. In the opinion of Pitman (1999) that attitude is a psychological construct exhibiting feelings towards an object. In the same vein, Moronkola and Akinterinwa (2003) documented that 16.7% of their sampled respondents had attitude which does not favour tobacco smoking but there was no significant gender difference in the attitude of students towards tobacco smoking. Morell, Cohen and Dampsey (2008) refuted the above submission in their findings that there were no gender differences among undergraduates in terms of their smoking behaviour.

This implies that a significant difference exists in tobacco smoking among the age groups of undergraduates of University of Lagos. Guindon and Boisclair (2003) supported the above findings that 90% of smokers are estimated to have begun smoking before the age of twenty. Moronkola (2003) said one's attitude may be deduced from one's action or behavior towards an object. In order to ascertain the age group in which the significant difference occurred, a multiple comparison of the age groups is presented in the table below Multiple Comparison of Age Groups and Behaviour towards Tobacco Smoking Among Undergraduates of University of Lagos.

Conclusıon

The study concluded that whatever behaviour man engages in can either make or mar him. The findings therefore showed that, female undergraduates had significant better knowledge, attitude and behaviour about health effects of tobacco smoking. It also revealed a significant difference exists in terms of age groups of undergraduates of the University of Lagos. Further still, the FGD showed that majority of female students were aware of the inherent dangers of tobacco smoking and that there is need for continuous enlightenment of undergraduates on the effects of tobacco smoking towards developing a healthy lifestyle. Tobacco smoking is a lifestyle that will not only endanger the health of the person but will also affect national and economic development.

Recommendatıons

It is therefore recommended that, tobacco smoking should outrightly be condemned and eradicated from the society, especially in academia, that governments should not relent in their public campaign which says smokers are liable to die young (Nigerian government slogan), that the proposed safety club in preventing drug use and other unhealthy lifestyles at the secondary schools across the nation towards developing a healthy lifestyle should be timely established, that health education centre should be established in every institution of higher learning where the following should be provided by a professional health educator i.e; smoking cessation, one to one quit coaching ,consultation on tobacco education policy and health education as a subject should be taught at the primary and secondary school levels.

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LECTURERS' AWARENESS ON THE USABILITY OF BLOCKCHAIN TECHNOLOGY FOR UNDERGRADUATES' RECORDS MANAGEMENT IN UNIVERSITIES IN KWARA STATE

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ABSTRACT

The advancement of Information and Communication Technologies (ICTs), in educational institutions enhance the efficiency and security of their academic record management systems. Blockchain technology offers a promising solution for improving student record management. The study however assessed lecturers' awareness of blockchain technology and its usability for undergraduate record management and determined the blockchain technologies lecturers have access to, accessed the awareness of lecturers on the usability of blockchain technology for record management in Universities in Kwara State, examined the usability of blockchain technology for record management, and identified the possible challenges that may affect the usability of blockchain technology for record management in Universities in Kwara State. A researcher-designed questionnaire was used to gather data from 100 respondents and analyzed using descriptive and inferential statistics. Findings indicate across three universities in universities in Kwara State. Challenges such as limited access to blockchain infrastructure, lack of comprehensive training, and resistance to technological change impede effective use. The study concluded that enhancing lecturers' knowledge and addressing infrastructural and perceptual barriers are crucial for successful integration of blockchain technology in managing undergraduate academic records. Universities in Kwara State need to invest in blockchain infrastructure and training programs to fully leverage this emerging technology. The study provides valuable insights for policymakers and educational institutions to adopt innovative solutions for improving academic record management.

Keywords: Blockchain, Records Management, Lecturers, Awareness and Technology

Introduction

The transformative potential of advancements in Information and Communication Technologies (ICTs) has gained widespread recognition across various sectors. The field of education has emerged as a fertile ground for leveraging ICTs to drive positive change. According to Aditya and Suranto (2024), educational institutions, including universities, stand to benefit significantly from the implementation of the advanced ICTs, especially in the efficient management of students' academic records. By harnessing the versatility and power of ICT, universities have unique opportunities to revolutionize their academic record management systems, leading to enhanced outcomes for both students and administrators. The administration of students' academic records in universities involves processes ranging from admissions to semester-based record-keeping and the generation of final results (Basri et al., 2018). It is crucial to provide these results to relevant stakeholders on time, using the appropriate format, and at a reasonable cost.

Implementing ICTs in records management can address existing challenges and enhance the overall efficiency of the system (Mukred et al., 2021). To achieve reliable, complete, accurate, up-to-date, and precise academic information, the introduction of advanced ICT is imperative (Mukred et al., 2019). Modern ICT offers various applications that are highly adaptable, user-friendly, and convenient, making them suitable for managing students' academic records in universities (Sajid et al*.,* 2024). These, modern technologies include cloud computing technologies*,* learning management system, gradebook software data analytics tools, automated assessment tools, Artificial Intelligence (AI), e-portfolios,

Blockchain technology can be used for keeping results, which can be easily shared with various other sources in the University systems. El Koshiry et al., (2023) stated that blockchain technology has the potential to solve diverse challenges in the institution of higher learning as it is most appropriate for the storage of various academic records in a distributed temper-resistant setting. The author furthered that, blockchain technology in organizational settings can be used to gather, preserve, and share authoritative information devoid of many technological hurdles. This implies that when utilized effectively, blockchain technology can facilitate secured transactions in the management of student results. Every block in the blockchain can store a small volume of data (generally around 1 MB), which might be any information that has to be stored securely while still being widely disseminated. These might be information on value transactions (virtual currency) exam credentials or learning records in the case of education (Sharples, & Domingue, 2021).

Statement of the Problem

The management of undergraduate records in universities is a critical component of academic administration, requiring accuracy, security, and efficiency. (Sun, et' al 2023) Traditional methods of record-keeping and result management often encounter issues such as errors, delays, and lack of transparency. With the advent of blockchain technology, there is potential for significant improvements in these areas due to its inherent qualities of immutability, transparency, and security. (Alain, et al. 2021) However, the successful implementation of blockchain technology in managing undergraduate results depends on several factors, including the awareness and preparedness of the academic staff, the availability of the necessary technology. However, potential challenges that may impede the usability of blockchain technology must also be identified and addressed to ensure a smooth transition from traditional methods to a more advanced, technology-driven approach. Therefore, this study aims to assess lecturers' awareness on the usability of blockchain technology for undergraduates' records management in universities in Kwara State.

Purpose of the Study

The main purpose of this study assessed the lecturers` awareness of the usability of blockchain technology for undergraduates` record management in Universities in Kwara State. Specifically, the study; check awareness first

1. assessed the awareness of lecturers on the usability of blockchain technology for record management in Universities in Kwara State;
2. determined the blockchain technologies lecturers have access to;
3. examined the usability of blockchain technology for record management; and
4. identified the possible challenges that may affect the usability of blockchain technology for record management in Universities in Kwara State.

Research Questions

The following Research Questions were answered to guide this study:

1. Are lecturers aware of the usability of blockchain technology for record management in Universities in Kwara State?
2. Which of these blockchain technologies do lecturers have access to?
3. What is the level of usability of Blockchain technology for records management in Universities in Kwara State?
4. What are the possible challenges that may affect the usability of blockchain technology for record management in Universities in Kwara State?

Review of Related Literature

Concept of Emerging Technologies in Higher Education

In the ever-evolving landscape of higher education, where innovation is prized and new technologies promise transformative change, blockchain stands out as both a beacon of hope and a mystery. While scholarly discourse has illuminated its potential benefits and the challenges it poses, the embrace of blockchain by educational institutions remains surprisingly tepid. This reluctance may stem, in part, from a pervasive lack of understanding among the broader population about the intricacies of blockchain technology (Lam & Dongol, 2022). Embarking on a narrative exploration, we venture into the heart of this enigma, seeking to unravel the tangled web of factors contributing to its subdued adoption: Firstly, the complexity inherent in blockchain's architecture presents a formidable barrier for students, educators, and professionals alike. Its intricate frameworks and sophisticated smart contracts often elude comprehension, dissuading academic institutions from venturing into uncharted technological territory (Agbo, et al., 2019).

As educational technology advances and embraces innovations, it becomes crucial to protect the sensitive data created by these systems. The rapid development of technology has made data security a top priority (Lee & Ahmed, 2021). The increased popularity of the Internet of Things (IoT), due to its innovative services and integration with artificial intelligence, edge/cloud computing, 5G, machine learning, and big data analytics, has created smart systems that generate sensitive data (Lee & Ahmed, 2021), necessitating robust security measures. Blockchain technology has been explored in various fields, including healthcare, education, and financial sectors, to enhance data security (Delgado-Von-Eitzen *et al*., 2021). The immutability, transparency, and decentralized nature of blockchain, along with its cryptographic features, offer a way to ensure tamper-proof and secure data transactions (Javaid et al., 2022). This has led to its growing popularity in recent years in business settings (Javaid et al., 2022), where blockchain technology has improved trading expenses, increased transaction auditability, quicker transaction settlement, and more effective monitoring (Javaid et al., 2022).

Nature and Concept of Blockchain Technology in Education

Blockchain technology has emerged as a transformative digital infrastructure with applications across various industries (Agarwal et al., 2021). Originally developed for the financial sector in 2009, blockchain is now being adopted in many

other domains, including education (Agarwal et al., 2021). Though blockchain offers numerous benefits, the lack of clear regulations around its use is a significant challenge (Mohammad & Vargas, 2022). The key advantages of blockchain technology stem from its decentralized, transparent, and immutable nature (Delgado-Von-Eitzen et al., 2021). Blockchain allows users to trust the technology, as data is stored and updated across a distributed network, providing transparency and security. Moreover, the open-source and publicly recorded nature of blockchain transactions enables high levels of traceability and reusability (Idrees et al., 2021). The immutability of blockchain also ensures that data cannot be easily manipulated (Idrees et al., 2021).

Research has shown that many small implementations in higher education have happened; however, success is limited. The full potential of Blockchain technology in education is desired. The Blockchain technology features and benefits proven so far have the potential to address most of the challenges currently experienced in the Higher Education Framework (Bucea-Manea-Țoniș et al., 2021). The rigidity of the current Higher Education System prohibits the Learner from choosing what to study, in terms of focus on a specific topic. Blockchain technology is suitable for the Higher Education Domain due to its immutability, transparency, and trustworthiness characteristics, which can be useful in Higher Education applications (Underwood, 2016). The Security feature of Blockchain is valuable to the Higher Education sector due to its digital signature and encryption. The Blockchain technology system for Higher Education needs to be secure, convenient, and tamperproof to keep records of certification and transcripts. Blockchain technology can provide a system that can control fraud (Chen et al. 2018).

Blockchain technology provides a robust framework for ensuring the security and integrity of student records, encompassing participation, coursework, grades, and certificates. When data is entered into a blockchain, it becomes immutable and tamper-proof, establishing a permanent record that is immune to unauthorized alterations. This immutability is crucial for maintaining the integrity of educational data; any necessary corrections require the addition of a new record rather than altering the original entry, thus preserving both the erroneous and corrected information for complete transparency (Politou et al., 2019). The implications of blockchain's immutability extend beyond mere data preservation. It fundamentally enhances trust in the educational system by guaranteeing that records are accurate and reliable. This feature is particularly important in preventing fraudulent activities, such as grade tampering or falsification of academic credentials. By providing a secure, unchangeable ledger, blockchain ensures that all stakeholders—students, educators, and employers can have confidence in the authenticity of the educational records.

Challenges Impeding the Usability of Blockchain Technology for Record Management

The integration of blockchain technology for result management encounters a myriad of formidable challenges, each posing significant obstacles to its widespread adoption and effective implementation. Among these hurdles are the existence of competing standards, complexities in devising shared governance models, concerns regarding intellectual property, risks of industrial espionage, and the ever-present specter of regulatory uncertainty (Lacity, 2019). Additionally, the decentralized architecture inherent in blockchain introduces a host of intricacies in fundamental areas such as data storage, permission management, and transaction validation, further complicating its implementation and operationalization (Dao, 2019). Notwithstanding these challenges, the potential benefits of blockchain technology cannot be understated. Its inherent features offer the promise of enhancing transactional security, reducing errors, and fortifying defenses against fraudulent activities (Pal, 2021). However, realizing these benefits is contingent upon surmounting the obstacles that impede its adoption, particularly in developing countries where a unique set of challenges exists.

Methodology

This study adopted a descriptive research design of the survey type. A survey design was deemed appropriate as it allows for the systematic collection of data from a predefined population to describe existing conditions or opinions. The population for this study comprised all lecturers in universities within Kwara State. The target population was narrowed to lecturers in three selected universities that were accessible and available for research purposes. To obtain a representative sample, a total of 100 lecturers were randomly selected from the target population. To enhance the robustness of the study, stratified random sampling was employed to ensure a fair representation of respondents based on gender and academic cadre. The stratification process categorized lecturers into different academic ranks (such as Assistant Lecturer, Lecturer II, Lecturer I, Senior Lecturer, and Professor) and gender groups. From each stratum, participants were selected using a simple random sampling technique to minimize bias and enhance the generalizability of the findings.

The instrument used for data collection was a researcher-designed questionnaire. The questionnaire consisted of five sections, each designed to gather specific information relevant to the study. The sections covered demographic Information, lecturers' awareness of blockchain technologies, usability of blockchain technologies and challenges affecting the usability of blockchain technologies. To ensure the validity of the questionnaire, it was subjected to expert review and evaluation. These experts assessed the questionnaire for clarity, relevance, and appropriateness of content. Their feedback was incorporated to refine the items and improve the instrument's overall effectiveness. For reliability testing, the questionnaire underwent a pilot study conducted with a small subset of lecturers who were not part of the main study sample. The responses from the administrations of the questionnaire were analyzed using a reliability coefficient test to ensure consistency in responses. Data collection was carried out in person and via online distribution where necessary. Participants were provided with clear instructions on how to complete the questionnaire. Ethical considerations, including informed consent and confidentiality, were strictly adhered to throughout the data collection process. Respondents were assured that their participation was voluntary and that their responses would be used strictly for research purposes. All collected data were analyzed using descriptive statistical methods. The analysis included mean scores, frequency counts, and percentage distributions to summarize and interpret the responses effectively.

Result

Table 1:

Distribution of Respondents by Gender

Gender	Frequency	Percent
Male	50	51.0
Female	49	49.0
Total	**100**	**100.0**

Table 1 shows the gender distribution of the participants. Out of the 100 respondents, 51 (51.0%) were male, and 49 (49.0%) were female. This shows that male respondents participated more in the study than the female.

Table 2:

Distribution of Respondents by Cadre

Cadre	Frequency	Percent
Graduate Assistant	46	46.0
Assistant Lecturer	9	9.0
Lecturer II	23	23.0
Lecturer I	4	4.0
Senior Lecturer	10	10.0
Associate Professor	5	5.0
Professor	3	3.0
Total	**100**	**100.0**

Table 2 shows that the participants' academic ranks vary. The majority of respondents were Graduate Assistants, which were 46 (46.0%) of the total. This is followed by Lecturer II with 23 (23.0%), Assistant Lecturers with 9 (9.0%), and Senior Lecturers also with 10 (10.0%). Lecturer I, Associate Professors, and Professors constitute smaller proportions of the sample, with 4 (4.0%), 5 (5.0%), and 3 (3.0%) respectively.

Table 3:

Years of Teaching Experience

Years of working experience	Frequency	Percent
0 - 5 years	60	60.0
6 - 10 years	28	28.0
11 years and Above	12	12.0
Total	**100**	**100.0**

Table 3 shows that the working experience of the respondents. The table shows that 60 (60%) of the respondents had 0-5 years, 28 (28%) had 6-10 years teaching experience while 12 (12%) had teaching experience of 11 years above.

Research Question 1: Are lecturers aware of the usability of blockchain technology for record management in Universities in Kwara State?

Table 4:

Awareness of Blockchain Technology Usability

Items	Mean (x)
I am familiar with blockchain technology	1.70
My organization has implemented blockchain technology in some capacity	1.88
I am aware of blockchain based badge systems	1.74
My organization has implemented or considered implementing blockchain based badge systems	1.92
Blockchain based badge systems provide significant benefits to our organization	1.74
I am aware of blockchain technology for records management	1.70
My organization has implemented or considered implementing blockchain for records management	1.79
Blockchain technology improves the effectiveness of records management	1.75
I am aware of blockchain technology for student record keeping	1.72
My organization has implemented or considered implementing blockchain for student record keeping	1.81
Grand Mean	**1.954**

Table 4 shows that item 4 had the highest mean score with 1.92 which sought to know if respondents organization had implemented or considered implementing blockchain based on badge system, this is followed closely by item 2 with a mean score of 1.88 which sought to know if respondents organization has implemented blockchain technology in some capacity, item 1 and 6 had the lowest mean score of 1.70 which sought to know if lecturers are familiar with blockchain

technology and aware of blockchain technology for records management. The table has a grand mean score of 1.94 which less than the 2.50 benchmark for the study, it can be concluded that lecturers are not aware of blockchain for record management.

Research Question 2: Which of these Blockchain Technologies do lecturers have access to?

Table 5:

Blockchain technologies lecturers' have access to

Blockchain Technology	*Frequency*	*Percentage*
Badge	19	81
Record management	12	88
File management	16	84
Copyright protection	14	86
Student record keeping	11	89

Table 5 shows that from the statistical analysis it was found that a significant majority, 81% of the respondents do not have access to the badge, while 19% of the respondents have access to the badge which is one of types of blockchain technology. In the Record Management, it was observed that 88% of the respondents are not accessible to records management. In contrast, 12% of the respondents are accessible to the record management. In addition to the analysis taken 84% of the respondents do not have access to file storage while 16% of the respondents do have access to the file storage. According to the data analysis 86% of the respondents do not have access to copyright protection while 14% of the respondents have access to the copyright protection which is one of the types of blockchain technology. From the analysis, a substantial percentage of 89% of the respondents do not have access to the students' record keeping, while the 11% of the respondents have access to this type of blockchain technology.

Research Question 3: What is the level of usability of Blockchain technology for records management in Universities in Kwara State?

Table 6:

Usability of Blockchain Technology

Statements	**Mean**
Ethereum and Bitcoin are used for record management.	1.67
Quorum is one of the blockchain for record management.	1.74
Blockchain technology can be used for record management	1.90
Blockchain technology generally used by lecturers purposely for records management.	1.80
Distributed ledger are recorded across multiple computers.	1.79
Grand Mean	**1.78**

Table 6 shows that the perceived usability of blockchain technology in education is also quite low, with a grand mean score of 1.78. The statement "I am aware that blockchain technology can be used to integrate teaching and learning processes" has a mean of 1.67, showing limited awareness of blockchain's potential in educational integration. Similarly, the statement "I know that blockchain technology can be used to record students' data" has a mean of 1.74, indicating some recognition but not widespread understanding. The mean for "I have been making use of blockchain technology to record students' results and information" is 1.90, which suggests that while there is some practical use, it remains relatively uncommon. Respondents also show a moderate understanding of the importance of blockchain for record management (mean: 1.80) but indicate a low level of engagement with seminars on technology integration (mean: 1.79). These scores

collectively suggest that while there is an acknowledgment of blockchain's potential benefits, actual usage and integration into educational practices are still limited.

Research Question 4: What are the possible challenges that may affect the usability of blockchain technology for record management in Universities in Kwara State?

Table 7:

Challenges Affecting the Usability of Blockchain for Record Management

Statements	Mean
Network is one of the problem that affect the usability of blockchain technologies for record management.	1.71
Inadequate technology background is one of the problem facing usability of blockchain for record management.	1.68
Time limitation is a major problem affecting blockchain usability.	1.79
sufficient fund is another factor affecting the usability of blockchain technology for record management.	1.79
Grand Mean	**1.74**

Table 7 highlights several significant challenges impacting the usability of blockchain technology for record management, with a grand mean score of 1.74. The statement "Network is one of the problems that affect the usability of blockchain technologies for record management" has a mean of 1.71, indicating that network issues are a major barrier. Similarly, "Inadequate technology background is one of the problems facing usability of blockchain for record management" (mean: 1.68) points to a lack of technical knowledge as a critical issue. Time limitations (mean: 1.79) and insufficient funds (mean: 1.79) are also identified as significant obstacles. These findings suggest that technical problems, a lack of expertise, and resource constraints are major factors hindering the effective implementation and utilization of blockchain technology in record management. Addressing these challenges is crucial for improving the adoption and functionality of blockchain solutions.

Discussion of Findings

The study conducted an analysis of lecturers' awareness and usability of blockchain technology for undergraduate record management in universities within Kwara State. The findings indicate a significant level of awareness among lecturers about the potential of blockchain technology in improving the management of academic records. However, this awareness is juxtaposed with notable challenges that hinder the effective adoption of blockchain systems.

The findings reveal that a substantial proportion of lecturers are aware of blockchain technology and its potential applications in academic settings, particularly in managing records. This high level of awareness is encouraging, as it suggests a readiness among academic staff to explore innovative technologies that can enhance the efficiency, security, and transparency of academic records management. This aligns with the literature reviewed, particularly the works of Agbo et al., (2019) and Delgado-Von-Eitzen et al., (2021), which emphasize the importance of understanding the technological framework for its successful implementation.

In contrast, while awareness is high, the practical application of this knowledge appears to be limited. The study found that while lecturers recognize the usability of blockchain for managing student records, there is still a gap between awareness and actual implementation. This echoes the findings of Amrutbhai (2020) and Reis-Marques et al., (2021), who noted similar challenges in other educational contexts.

Regarding the usability of blockchain technology, the study found that blockchain is perceived as highly usable for academic record management. Lecturers recognize its potential benefits, such as enhanced security, transparency, and efficiency, which are crucial in addressing the traditional challenges of record-keeping, such as errors, delays, and lack

of transparency. These findings align with the literature, particularly the studies by El Koshiry et al., (2023) and Javaid et al., (2022), which highlighted the transformative potential of blockchain in educational administration.

However, despite the recognized benefits, the study also identified several challenges that affect the usability of blockchain technology. Technical barriers, such as the complexity of blockchain systems and the lack of standardization, were highlighted as significant obstacles. Non-technical barriers, such as insufficient financial resources and a lack of skilled professionals, were also noted. These challenges resonate with the broader literature on technological adoption in education, where similar obstacles have been identified, such as in the studies by Mohammad & Vargas (2022) and Lacson et al., (2023).

The findings of this study are largely consistent with the reviewed literature. For instance, Kuleto et al., (2022) and Habib et al,. (2022) also emphasized the potential of blockchain technology to revolutionize academic record management through enhanced security and efficiency. However, like the present study, they also pointed out the persistent challenges, such as regulatory compliance and the need for tailored solutions to fit diverse institutional frameworks.

In summary, while the findings affirm the critical role of blockchain technology in modernizing academic record management, they also highlight the need for strategic interventions to address the identified challenges. These include investing in robust blockchain infrastructure, providing comprehensive training programs for lecturers, and developing standardized protocols and guidelines for blockchain use in academic settings. The study's findings suggest that addressing these challenges will be crucial for the successful adoption and implementation of blockchain solutions in universities.

Conclusion

The study concludes that blockchain technology holds substantial potential to revolutionize academic record management in universities. The low level of awareness among lecturers indicates their readiness to adopt this technology. Blockchain's attributes, including enhanced security, transparency, and efficiency, are recognized as crucial advantages that could address many of the traditional challenges associated with academic records management.

Despite blockchain potential, the study emphasizes that technical challenges, resource gap, and trainings are key obstacles to its successful integration into academic records management. Hence, this addresses issues that are essential for effective implementation.

Recommendations

Based on the findings and conclusions of this study, the following recommendations are proposed to enhance the usability of blockchain technology for academic record management in universities:

1. Conducting awareness campaigns to educate stakeholders, including students, parents, and employers, about the benefits of blockchain technology in academic record management can facilitate its acceptance and adoption.
2. It is essential to provide lecturers and administrative staff with training and development programs focused on blockchain technology.
3. Efforts should be made to develop standardized protocols and guidelines for the use of blockchain technology in academic record management.
4. Implementing pilot projects and conducting case studies can provide valuable insights into the practical challenges and benefits of using blockchain technology in academic record management.

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EFFECT OF SELECTED DRAWING APPLICATIONS ON STUDENTS' ACADEMIC PERFORMANCE IN CULTURAL AND CREATIVE ARTS IN ILORIN, NIGERIA

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ABSTRACT

Drawing applications like Autodraw with Artificial Intelligence (AI) online and Sketchbook without AI offline are used for drawing and painting, in order to improve students' performance in a technological enhanced approach in Cultural and Creative Arts (CCA). However, despite the availability of drawing applications, students lack the ability to create digital images in CCA. Therefore, this study investigated the effect of selected drawing applications on JSS students' academic performance in cultural and creative arts in Ilorin. Objective of the study was to: (i) determine difference in the performance of JSS students taught drawing and painting using Autodraw and Sketchbook applications in CCA. The study adopted a post-test only control group design. The population was all JSS students in Ilorin, the target population was JSS students in two schools. Purposive sampling technique was used to select 51 JSS two students. Validated Autodraw and Sketchbook applications were used for data collection. Data collected were analyzed using descriptive and inferential statistics at 0.05 significant level. There was a significant difference in the academic performance of JSS students taught drawing and painting using Autodraw and Sketchbook applications, df (49) t= 2.54, $p \leq 0.05$; The study concluded that drawing applications significantly improved JSS students' academic performance. The study recommended that drawing applications should be integrated in CCA, and JSS students should be trained further by CCA teachers on the use of drawing applications.

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Keywords: *Effect, Drawing Applications, JSS Students', Academic Performance, Cultural and Creative Arts*

Introduction

The proliferation of emerging technologies is becoming an essential integration in education. The impact of emerging

technologies are already noticeable and driving significant aspect of human life, especially in education. According to Rotolo, Hicks and Martin, (2015); and Kabugo, Masaazi and Mugagga, (2015), emerging technologies are the new generation of technologies integrated or yet to be integrated for the enhancement of educational activities. The concept of emerging technologies in education according to Velesiatnos, (2010) are tools, innovations, concepts and technological developments employed to serve various educational purposes. Notable emerging technologies include; artificial intelligence, machine learning, augmented reality, virtual reality among others.

Specifically on artificial intelligence, it is the field of computer science concerned with the making of intelligent machines, computers, applications and systems whose work patterns are similar with human intelligence. It is a technological innovation that is applied to help automate task in various fields of human endeavors. In education, the integration of artificial intelligence is not only applied to automate academic and non-academic tasks, but also aimed at complementing and enhancing existing instructional process.

Therefore, the goal of artificial intelligence in education according to Gulson, Murphie, Taylor and Sellar, (2018); Luckin, Holmes, Griffiths and Forcier, (2016) is to enable more personalized, flexible and engaging teaching and learning process through automated instruction, assessment and feedback. For instance, Borge, (2016) opined that AI tutoring system, can be used to provide learning support for students' and engage students' in dialogue, question and answer, and provide adequate feedback, especially in distance learning situation. In view of the proliferation of artificial intelligence as an emerging technology in education, concept like intelligent user interface (IUI) has also emerged in education. IUI also involves aspects of artificial intelligence such as the automation of functions in intelligent drawing application like Autodraw. The concept of user interface (UI), which is interchangeably used with intelligent user interface (IUI), is a concept that deals with how humans interact with computer or technological applications, the aim of which is to ensure an effective human control of technological applications.

Students' interaction and effective use of Autodraw and Sketchbook applications to create images, is an example of IUI concept peculiar to this study. The works of Kolski, Boy, Melançon, Ochs, and Vanderdonckt, (2020); Schmidt, Mayer, and Buschek, (2021) further explained examples of areas in which IUI is used for different purposes, such as the popular Microsoft office assistant, that gives intelligent assistant to users on various needs, speech recognition, recognition of human language, visual recognition of users and objects, gesticulations, and use of digital art among others. Considering human daily interaction with technology, it is therefore imperative to integrate innovative technologies in teaching and learning process, in order to foster an educational goal that prepares students' for useful living in a technology driven society. The integration of technology in education is an intentional endeavor that should start from Secondary School level, with subject like Cultural and Creative Arts (CCA), which is one of the core subjects taught at JSS one to three levels, and was established through the merger of fine arts, music, drama and dance.

Specifically, while the integration of technology in CCA is complementary with the conventional strategy. It is important to focus on students' skills development with technology in CCA, especially with the emergence of drawing applications like Autodraw and Sketchbook, which can be used to develop student's ability to draw and paint in CCA. These drawing applications are mostly designed to ensure intelligent human and technology interaction in making digital images. Drawing applications are either online or offline based, they are applications developed to design, sketch, create or manipulate images in digital form. Drawing applications are designed with user friendly interface, features and tools like; pencils, pens, brushes, colour palette and many others that help users sketch, draw and paint with ease. A few drawing applications include; Autodraw, Sketchbook, krita, vectr, instant artist, inkscape, adope illustrator, corel draw, photoshop,

medibang paint, ibis paint x, mypaint, and many others.

Specifically, Autodraw is an artificial intelligence (AI) web-based application, developed on the concept of intelligent user interface that helps to predict and assist users drawing and painting online. Schoenbart, (2018) noted that Autodraw is an intelligent web-based application that identifies and predicts along as a user draw each line of a sketch and then suggests better ready-made image options. Hence, G-Souto, (2017) noted that Autodraw is equipped with simple basic tools and features like Autodraw, colour fill, draw, select, resizing, text and shape to assist users drawing and painting online. On the other hand, Sketchbook is a drawing and painting application used to create digital art designs without the help of AI. It is available on smartphones, tablet, desktop windows, Android and iOS platforms. Walker, (2023) noted that Sketchbook has a user-friendly interface, embedded with interesting tools like different pencils and brushes sizes that make the process of drawing and painting in digital form look real and original.

Specifically, both Autodraw and Sketchbook applications are used by designers for drawing, and also used by book publishers to draw and create illustrations for JSS students', in order to clarify concepts in CCA. Also, Autodraw and Sketchbook applications are used by teachers for instructional purpose in CCA. Hence, this study compared both applications and determined which one is better for students' learning and academic performance. Also, both applications were used in this study because the working tools and features on the applications are basic enough for the level of JSS students' to use in developing digital drawing and painting skills. In another development, empirical studies on the effect of intelligent user interfaces (IUI), and effect of visual arts on student's performance are reviewed as empirical support for this study. Brdnik, Hericko, and Šumak, (2022) noted that IUI are human computer interaction driven by the goal of improving user experience and usability with the aid of AI. Akyuz, (2020) revealed that IUI is used to enhance students' performance in CCA, and it has positive impact on students' personalized learning.

More studies were explored on IUI as used in creative arts, Ngoon, Kim, and Klemmer, (2021) explored Shöwn intelligent system, and reported that using Shöwn improved creativity, timeliness, clarity and uniqueness of drawings, compared to other method. Oh, Song, Choi, Kim, Lee, and Suh, (2018) studied a prototype of DuetDraw and showed that users significantly found DuetDraw to assist and improve their drawings. Also, empirical studies on visual arts as it relates to this study were explored. Tomljenović, (2015) revealed a significant difference in students' performance based on the interactive model of teaching and learning visual arts. Similarly, Punzalan, (2018) also revealed that the experimental group exposed to visual arts appreciation performed better.

Statement of the Problem

Cultural and creative arts is a practical oriented subject, and students' often find the aspect of drawing and painting difficult, which make students' loose interest and perform poorly in CCA. However, since the turn of the 21st century, there has been a paradigm shift to technology integration in teaching and learning process, and the digital skills students' considered digital natives are exposed to. Especially with the increasing quest for digital applications that can solve educational problems, develop students' digital skills and improve academic performance. In view of this, several artificial intelligence and digital applications that can be used for drawing and painting in CCA have emerged. Prominent among these are Autodraw with AI online and Sketchbook application without AI functions offline respectively.

However, despite the availability of drawing applications, the lack of change in the teaching method of CCA has largely contributed to JSS students' inability to use drawing applications like Autodraw and Sketchbook to create basic digital images, which is essential for improving students' academic performance in CCA. Thus, the lacuna this study filled was

the use of drawing applications like Autodraw and Sketchbook to improve JSS students' academic performance in a technology enhanced approach in CCA. Therefore, this study, compared Autodraw with AI online and Sketchbook application without AI offline, and determined the effect the use of both drawing applications have on JSS students' academic performance in CCA.

Purpose of the Study

The main purpose of this study was to determine the effect of selected drawing applications on JSS students' academic performance in Cultural and Creative Arts in Ilorin. Specifically, the study:

1. determined the effect of Autodraw and Sketchbook applications on the academic performance of Junior Secondary School students' taught drawing and painting in Cultural and Creative Arts.

Research Question

The study raised one research question:

1. what is the effect of Autodraw and Sketchbook applications on the academic performance of Junior Secondary School students' taught drawing and painting in Cultural and Creative Arts.

Research Hypothesis

The only hypothesis was formulated and tested in the study at 0.05 significant level:

Ho_1: there was no significant difference in the academic performance of Junior Secondary School students' taught drawing and painting using Autodraw application online and those taught using Sketchbook application offline in Cultural and Creative Arts.

Methodology

The researcher adopted a post-test only control group design. The study had two experimental groups. The first experimental group was exposed to the use of Autodraw application online. While the second experimental group was exposed to the use of Sketchbook application offline. Then, both groups were post-tested with the same practical tasks (to draw and paint) using the respective applications. The population for this study were all Junior Secondary School students' in Ilorin, Kwara State, Nigeria. The target population were Junior Secondary School students' in school A and school B, which were the first and second experimental groups with 24 and 27 participants respectively, making a total of 51 participants. A purposive sampling technique was used to randomly select JSS two students' offering CCA in school A and school B.

The research instruments for this study include the Autodraw web-based application that was used to teach the first experimental group drawing and painting online, and the Sketchbook application that was used to teach the second experimental group drawing and painting offline. The research instruments was validated by three experts namely; cultural and creative art teacher for face and contents validity, graphics designer for technical validity, and educational technology expert for suitability and overall instructional use validity. The researcher sort permission from the target schools to carry out the study. Also, the researcher ensured utmost confidentiality of participants and strict adherence to all research ethics at every stage of the study. Then the researcher exposed JSS students' to the use of Autodraw and Sketchbook applications to draw and paint in CCA. Data collected for the study was analyzed using descriptive and inferential statistics. The data was coded on Excel spread sheet, and analyzed using Statistical Product and Service Solutions (SPSS) version 23.0. Frequency, Percentage, Mean and Standard Deviation was used to analyze demographic information and answered research questions respectively, while *t-test* was used to test all research hypotheses at

significant level of 0.05. In order to determine the effect of drawing applications on JSS students' academic performance in CCA.

Result

Research Question: what is the difference in the academic performance of Junior Secondary School students' taught using Autodraw application and those taught using Sketchbook application in Cultural and Creative Arts?

Table 1:

Mean and Standard Deviation of JSS Students' taught Drawing and Painting using Autodraw and Sketchbook Applications

Treatment Groups	N	Mean	Std Deviation
Autodraw App	24	59.33	7.81
Sketchbook App	27	54.44	5.91

To answer the research question, respondents were treated to the use of Autodraw and Sketchbook applications respectively, post-tested to compare and determine students' academic performance in the use of both applications for drawing and painting in CCA. Mean and standard deviation were used to analyse students' performance. Table one showed 59.33 mean score and standard deviation of 7.81 for Autodraw application group. While, Sketchbook application group had 54.44 mean score and standard deviation of 5.91. Based on the analysis, there is a mean difference of 4.89 in favor of Autodraw application group. The implication is that students' in the Autodraw group performed better than those in the Sketchbook application group.

Research Hypothesis One: there was no significant difference in the academic performance of Junior Secondary School students' taught drawing and painting using Autodraw applicatin and those taught using Sketchbook application in Cultural and Creative Arts.

Table Two:

t-test Analysis of JSS Students' Academic Performance using Autodraw and Sketchbook Applications

Treatment Groups	N	X	SD	Df	T	Sig.(2-tailed)	Decision
Autodraw App	24	59.33	7.81				
				49	2.54	.014	Rejected
Sketchbook App	27	54.44	5.91				
Total	**51**						

Table two showed the t-test result of JSS students' academic performance taught drawing and painting using Autodraw and Sketchbook applications respectively. It can be deduced from the hypothesis tested that there was a significant difference in the academic performance of JSS students' taught drawing and painting using Autodraw and Sketchbook applications respectively. This is reflected in the result of the hypothesis tested; df (49) t= 2.54, $p \leq 0.05$. Thus, the hypothesis which states that ''there is no significant difference in the academic performance of Junior Secondary School students' taught drawing and painting using Autodraw and those taught using Sketchbook application in cultural and creative arts'' is rejected. Therefore, with a mean difference of 4.89 in favour of the Autodraw group. The implication is that, JSS students' in the Autodraw group performed better than their counterpart in the Sketchbook group.

Discussion of Findings

This study investigated the effect of selected drawing applications on JSS students' academic performance in cultural and creative arts in Ilorin, Nigeria. Two experimental groups (auotdraw with AI and Sketchbook without AI) were involved in the study. Findings of this study showed that drawing applications (Autodraw and Sketchbook) enhanced students' academic performance in CCA, which is consistent with Akyuz, (2020) study that intelligent digital applications enhance students' performance and personalized learning in creative arts. According to Oh, et.al, (2018), DuetDraw AI was significantly found desirable in assisting users drawing task. The study is consistent with findings of this study that showed significant difference in students' use of AI Autodraw than the Sketchbook application.

Also, Ngoon, et.al, (2021) study on Shöwn application, and Williford, Runyon, & Hammond, (2020) study on intelligent rectilinear perspective accuracy recognition, both improved originality and uniqueness of user's freehand drawing, both studies were also consistent with findings about Sketchbook that significantly improved students' performance and freehand drawing and painting without AI assistance in CCA. In view of the discussion, the researcher is of the opinion that both AI and non AI enabled applications can conveniently be used to improve students' digital drawing and painting skills in CCA.

Conclusion

The study concluded that drawing applications (Autodraw & Sketchbook) significantly improved JSS students' academic performance in CCA. However, there is further need for students' awareness, orientation and trainings on the use of drawing applications both online and offline, in improving JSS students' digital drawing and painting proficiency, skills development and ensure an improved academic performance in CCA. Therefore, based on findings of this study, the study concluded and recommend the use of drawing applications in CCA, as it significantly improved JSS students' academic performance in CCA.

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STAKEHOLDERS' PERCEPTION OF THE ROLE OF TECHNOLOGY IN BRIDGING THE GAP BETWEEN BUSINESS EDUCATION AND INDUSTRY NEEDS IN SOUTHWEST NIGERIA

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ABSTRACT

As technology continues to evolve this further divides the gap between academic curriculum and industry demands. This study explored stakeholders' perceptions of the role of technology in aligning business education with industry needs in Southwest Nigeria. The aims were to assess the current state of technology integration in business education, evaluate its impact on graduate employability, and identify challenges and potential opportunities for improvement. The research employed descriptive survey design, with 200 respondents comprised of business educators, industry practitioners and final year business education students, using multi-stage sampling techniques. Data were collected using a structured questionnaire and analyzed using descriptive statistics, including mean and standard deviation to identify significant differences among the stakeholder group. Results demonstrate that while there is some moderate level of technological integration into business education curricula, there are significant infrastructural and educator training shortfalls. Perceptions from stakeholders show that the role of technology cannot be understated in terms of improving graduate employability and making them more competitive in the industry but that there are impediments to it e.g., poor funding, erratic power supply and un-perceptiveness to change. The study concludes that effort is being made but more needs to be done to overcome challenges and realize the opportunities technology holds for business education. The recommendations include a boost in infrastructure investment, continuous education for teachers, and improved academia-industry relations to ensure that the outputs of both institutions are relevant to industry requirements.

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Kevwords: Technology integration, business education, graduate employability, industry alignment, Southwest Nigeria

Introduction

Technology enhancing education sectors and industries are the hallmarks of most current economies. These technological disruptions have an especially drastic impact on business education — the training ground for individuals entering the corporate world. At a global level, Industrial Revolution has transformed industries, emphasized automation, artificial intelligence and digital tools (Schwab, 2016). The adoption of technology has great effects on every area of the industrial sector. Technology in packaging, storage and transportation industries in Southwest and use of data analytics help to optimize recipes and processes. In textile manufacturing, the use of technology in weaving, kitting and dying and digital design software allows increased production. Electronic manufacturing industries in Nigeria use technology in assembling and testing as well as the use of digital design tools make electronics acceptable worldwide. In the automobile assembly, the use of robotic for welding painting and other assembly tasks, and technology based tools for vehicle design and testing ensures standardization, safety control and durability of the products. There is a significant correlation between technology adoption and product innovation and consumer satisfaction, and sustainability of business performance in Nigeria Breweries Plc., Lagos, (Ladokun, 2019) Similarly, technological development, process innovation, product

innovation, organizational structure and have significant positive effects on the performance of manufacturing firms, such as Dangote conglomerates, (Ovivi Fasasi, Okolo & Muhammed 2022).

Technology has facilitated international trade enabling Nigerian industries to access global markets and compete on a larger scale. It has reduced waste, optimizing processes and helped industries lower production cost and improves profitability. Technological adoption paves the ways for creativity and innovation in organizations and is a sustainable source of competitive advantage. Modern technology in businesses is a very vital tool in product development processes and product development performance (Nambisan, 2013). Generally, technology has significantly reshaped Nigeria industries promoting efficiency, innovation, and competitiveness. Therefore, educational systems must adapt and change along with these transformations like never before.

In recent years Southwest business settings, a high number of manufacturing firms do not actually budget and invest funds enormously to adopt and deploy modern and new technology. This has led to long stay and low attraction to product innovation in many manufacturing companies in the region and led the slow pace of new product development. In the Southwest region of the country, the alignment process between business education and the demands of industry has proven to remain a challenge leading to issues regarding graduate employability and job readiness. The traditional approach of emphasizing theory into the business education offered in Nigeria has influenced the course contents at many levels of studies. Those in secondary and tertiary institutions deal with theoretical knowledge while practical and technology-driven industries require new skills to thrive. Adeola and Olatunji (2020) explain that numerous Nigerian institutions still employed curricula that were inadequate for the applicability of required skills in modern workplaces. There is a significant skills gap because of this misalignment, with industries having a hard time finding suitably trained employees and graduates having a hard time finding meaningful employment.

Thus, integrating technology into business education has been a means of bridging this gap. Industries now employ several technologies, data analytics tools, and collaborative platforms, indicating the need for educational institutions to introduce students to these tools (Okafor, Adebayo, & Chukwuemeka, (2021). However, the level at which technology is adopted in the business education curriculum in Nigeria is low owing to infrastructural deficits, lack of qualified teachers and insufficient funding (World Bank, 2022). There are high stakes in the context of Southwest Nigeria, where several economic hubs are located. Although industrial cities like Lagos and Ibadan are economic hubs, a high proportion of graduates from these regions fail to meet the technological needs of industry (Chinze, 2024). According to the National Bureau of Statistics (2021), 33.3% of Nigerian graduates are unemployed, as many employers have stated that the skills mismatched with the individuals that are trained locally are the primary reason for their unwillingness to employ such candidates in their organizations.

Integrating technology into business education offers two opportunities: First, it can improve pedagogical practices by offering effective teaching tools like virtual reality simulation software, and online collaborative platforms (Tondeur, Aesaert, & Van 2017). With these tools, the students can gain practical learning experiences and better insight into how the industry works. Second, technology can be a direct link between educational institutions and industries from platforms that facilitate internships, mentorship programs, and real-time industry collaborations (Eze, 2020). While there are opportunities through these tech solutions, there are also challenges to effectively integrate the technology for aligning the business education with the business needs. Few institutions in south west Nigeria are equippied with virtual reality stimulation software. The infrastructural challenges of limited supply of technology, poor connectivity, power supply etc. are rife in Nigeria (Adedokun, Olutola, & Yusuf, 2021). Furthermore, there is poor policy coherence and stakeholder engagement among major players in the educational institutions and industries, many of whom operate in

isolation (Ugwoke, Chukwuemeka ,& Nnamdi, 2018).

The pandemic of COVID-19 has highlighted the continuing need for technological abilities in education and work worldwide. Numerous institutions had to move to online learning systems, which showcased the benefits and the drawbacks of technology in Nigerian education (Onyema, Eucheria., & Obafemi, 2020). This not only propelled it to the foreground but also made it clear the need to bridge the gap between business education and industry needs,, are absolutely critical for sustainable national development. The use of technology to create a gap between business education and industry needs in Southwest Nigeria is paramount and multifaceted. Similarly, there has been widespread agreement among key constituents that technology should stand at the core of any initiative to produce 21st century workforce.

Statement of the Problem

Business education programme in tertiary institutions in Nigeria is under pressure from modern industries to keep up with the globalized and competitive world. Although Southwest Nigeria hosts some of Nigeria's leading economic centers, many of its tertiary institutions have been unable to incorporate innovative technology into the areas of study for which it is known. This disconnect has led to an increasing skills gap, with graduates entering the workforce unequipped with the necessary skills and industries unable to find suitable candidates. The business education system finds it hard to adopt modern startups like data analytics, cloud computing, digital collaboration tools etc. In this way, whilst industries are progressively adopting modern technologies, most educational institutions in Southwest Nigeria do not have the tools and underlying framework to integrate them into their practice. Outdated curricula and the inadequate synergy between educational institutions and industry stakeholders compound the issue, as the skills taught in classrooms often do not align with the skills needed in the workforce. Moreover, infrastructure issues like intermittent power supply, unreliable internet connectivity, and low funding limit business education modernization. There are few trained qualified business educators who are equipped to effectively teach with current and emerging digital technologies as well, so students don't receive much exposure to industry standards for tools and practices.

This mismatch in skills leads to the high unemployment rate among graduates and the un-competitiveness of industries in Southwest Nigeria. Local employers often list lack of practical skills and technology proficiency as the primary deterrents to employing local graduates. Consequently, the region's economic growth and development potentials remain untapped. In this context, the challenge is to adapt the teaching methodologies of these schools to reflect the evolution and rapid acceleration of the way business is done. The study investigates stakeholders' perceptions of these challenges and suggests practical strategies for bridging academia-industry gap in business education in Southwestern Nigeria.

Purpose of the Study

This study examines stakeholders' perceptions of technology application in bridging the gap between business education programme and industry needs in Southwest Nigeria. This aim of the study is to discern actionable pathways, using technology as an enabler, to realign the two, business education, and industry demands by examining these perceptions. Specifically, the study does tend:

1. To determine the state of technology integration in business education in Southwest Nigeria.
2. To examine the perceptions of industry stakeholders about the skills and competencies of business education graduates
3. To elucidate the difficulties that educational institutions encounter in embracing and incorporating technology within their curriculums.

4. To suggest ways to enhance collaboration between education and Edutech companies' sectors in terms of skill development through the inclusion of technology.
5. To study the effect of increased technology adoption on graduates' employability and industries competitiveness in Southwestern Nigeria

Research Questions

The following research questions emerged as guidance for this study:

1. What is the level of technology integration into business education curricula in Southwest Nigeria?
2. How do industry stakeholders perceive business graduates in terms of knowledge and competency?
3. What are the challenges faced in implementing and integrating technology in educational institutions for teaching?
4. How can educational institutes and industries work effectively together using technology for skills?
5. Does improved technology adoption positively affects graduate employability and enhances industry competitiveness in southwest in Nigeria?

Literature Review

While the body of research has delved into the nexus of technology assimilation, commercial instruction, and sector requisites, it has spotlighted the dual nature of this intersection, elucidating the trials and avenues connected to harmonizing instructional results with industrial mandates. For instance, Tondeur et al. (2017) noted that, digital tools, like enterprise resource planning (ERP) systems and virtual learning environments, provide amazing opportunities to improve students' industry readiness through imparting real-life experience, collaboration, and analytic skills, Adeola, and Olatunji, . (2020**),** opine that the low use of technology in business education in Nigeria can be attributed to infrastructural deficit, non-funding by the government, and untrained teachers who nurtured the skill sets gap between graduates and the industry. Adedokun et al. (2021), also note that poor and erratic power supply, as well as limited access to high-speed internet, are some of the critical barriers to technology adoption among Nigerian tertiary institutions. The need of technology-savvy graduates is ever-increasing worldwide. As mentioned by World Economic Forum (2020), skills like analytical thinking, digital literacy, and problem-solving are among the top competencies that employers pursue for. Adeola, et al (2020) set out that the curriculum of many business education programs in Nigeria remain outdated and do not prepare graduates with the necessary skills for the modern workplace. There is also negligence of working alongside the private sector which widens the gap (Eze 2020). The COVID-19 pandemic that forced institutions to use the online learning platforms has proved the important role of technologies on flexible, interactive learning environments (Eze, 2020). This transition revealed how MOOCs (Massive Open Online Courses) and LMS (Learning Management Systems) opened a new horizon for education to overcome regional and resource constraints. However, Obara, & Okon, (2020). also warn that these advantages are not equally shared because of disparities between students from wealthier and less well-off backgrounds, with the latter group often unable to obtain the necessary devices or internet access.

Studies on experiential learning add further support to the role of technology in bridging the skills gap. Kolb's Experiential Learning Theory (1984) emphasizes learning through experience, reasserting the value of experiential learning in education. The technology like virtual reality (VR) and simulation programming can correspond with this theory due to the fact that both permit students to have practical experiences transacting throughout the business world (Tondeur et al., 2017). This points to the value of interactive technologies in business education and skills development, as underscored by Okonkwo (2019). The authors specifically noted that skills in data analytics, financial modeling, and supply chain management are fostered through use of interactive technologies.

Systemic issues in Nigeria's education sector further compound the challenges to technology adoption. Ugwoke et al, 2018). They mention that the institutional inertia and resistance to change are known to be also one of the main obstacles in the evolution of business education. This is often accompanied by inadequate government investment in digital infrastructure and capacity building. The National Bureau of Statistics (2021) has, for instance, shown that less than 10% of Nigeria's annual budget is allocated to education, while UNESCO recommends a spending allocation of 15-20% on education. But this funding gap inevitably restricts an institution's ability to purchase the neede technology to train its educators and to keep up with the technology infrastructure it must in place.

Despite these challenges, there are some programs that show promise for improvement. For instance, educational and industrial partnerships in Lagos have organised internship programs and skill-development workshops that introduce students to industry practice (Okonkwo, 2019). It has also been done for Nigerian tertiary institutions, as evidenced by the involvement of international organizations, including the World Bank (2022); funding projects aimed at enhancing digital infrastructure and teacher training. These important but still minor efforts also show how the involvement of various stakeholders is crucial to overcoming the skills mismatch. The literature further indicates the need for a paradigm shift in business education. Schwab (2016), claims that the Fourth Industrial Revolution calls for a rethinking of how to educate, focusing on lifelong learning and adaptability. This is especially the case for Southwest Nigeria, with industries including banking, telecommunications and logistics more traditionally depending on advanced technologies. However, as Tondeur et al. (2017) pointed out, successfully adopting these technologies in schools goes beyond financial investment; it necessitates a cultural shift among educators and administrators towards adopting innovation.

Theoretical Review

Appreciating the role of technology in narrowing the gap between business education programme and industry requirements can be contextualized within various theoretical frameworks This study is hinged on Technology Acceptance Model (TAM) postulated by Davis, The theory reiterates the appeal of perceived ease of use and perceived usefulness of technology in determining an individual's inclination to embracing technological innovation — TAM continues to receive widespread validation in the context of education to explain how students and faculty embrace tools that are technology-centric such as simulation software, virtual reality and collaboration platforms in teaching and learning processes (Venkatesh and Bala, 2008); However, the concept of technology acceptance model (TAM) does not consider the complex nature and possible challenges of technology adoption in the contemporary educational and industrial sectors, as in southwest Nigeria due to the increasing technological changes, as well as skills needed for acquisition and maintenance.

Another complementary theory is Experiential Learning Theory which prioritizes hands-on learning experiences, an approach that has been integrated through technology such as virtual labs, augmented reality, and interactive business scenarios that emulate real world problems which students must breakdown and solve (Tondeur, et al 2017). Kolb's Experiential Learning Theory (1984) further supports the role of technology in bridging the skills gap. The theory emphasizes learning through experience, reasserting the value of experiential learning in education. Technology like virtual reality (VR) and simulation programming can correspond with this theory due to the fact that both permit students to have practical experiences transacting throughout the business world (Tondeur et al., 2017). This points to the value of interactive technologies in business education and skills development, as underscored by Okonkwo, 2019) who specifically noted that skills in data analytics, financial modeling, and supply chain management are fostered through use

of interactive technologies. However, when there is persistent challenges or obstacles in the adoption of technology, as experiences in the education sector of southwest Nigeria, there will be disconnect between the skills acquired through education and the skills required by employers, the value of the education is significantly undermined (Tondeur et al., 2017). Thus, signaling the importance of educational sector making sure that there is a connection between skills acquired through technology education and the skills demanded by employers in the labour market.

Methodology

The study is a descriptive method of survey design. It examines the perception of stakeholders on the roles of technology in closing the gap between business education and the need of the industry in South-West Nigeria. The study population was business educators, industrial practitioners, and 400 level business education students in universities offering business education in South west Nigeria. The sampling technique used in selecting the sample size of 200 respondents was multi-stage sampling. The first stage involved the purpose sampling of the three states (Lagos, Ogun and Oyo State) in Southwest Nigeria, based on their prominence in education and industrial activities. Stratified sampling was applied to select participants of the second phase consisting of 70 business educators, 70 industry representatives and 60 final-year students from the three stakeholders. A structured self developed questionnaire was the research instrument, used to elicit the participants' perceptions of the role of technology in aligning business education curricula with the need of the industry. The questionnaire had focused on covering the current state of business education, the role of technology, and any suggestions for improvement.

Two experts from the Department of Test and Measurement, Ekiti State University, Ado Ekiti validated the instrument. The Reliability was carried out from Ilorin, Kwara state, outside the study area and reliability coefficient 0.75 was achieved. The questionnaire was administered physically, and the survey was supplemented with online surveys to improve response rates. The data collected was analyzed by using descriptive statistics. Results are reported in tables and figures for ease of understanding and interpretation.

Results

Research Question 1: To what extent is technology integrated into business education curricula in Southwest Nigeria?

Table 1: Extent to which technology is integrated into business education curricula in South West Nigeria

S/N	Statements	Mean	SD
1	Modern digital tools, such as data analytics software and collaborative platforms, are adequately included in the business education curricula of institutions in Southwest Nigeria.	3.30	1.00
2	Students in business education programs frequently engage with industry-relevant technological tools during their coursework.	3.38	0.91
3	The existing curriculum effectively incorporates emerging technologies, such as artificial intelligence and cloud computing, into teaching and learning processes.	3.53	0.77
4	There is adequate infrastructure (e.g., computer labs, high-speed internet) to support the integration of technology in business education programs in Southwest Nigeria.	2.09	0.85
5	Business education lecturers are well-trained and competent in using technology to enhance teaching and learning.	2.50	0.92
6	The integration of technology in business education curricula aligns with the technological demands of industries in Southwest Nigeria.	3.68	0.68

Table 1 describes the integration of technology into business education programs among institutions in Southwest Nigeria. .The integration of modern digital tools like data analytics software and collaborative platforms is rated moderately

(Mean = 3.30, SD = 1.00). This indicates some usage of these tools, but potentially not cosmological or institutionally-systemic. Similarly, another aspect that scored moderately well (Mean = 3.38, SD = 0.91) was the extent of exposure students had with technological tools relevant to the industry while doing coursework, which indicated regular but limited use and similar to the earlier point, where scope for improvement exists. For example, artificial intelligence and cloud computing seem to be relatively integrated and integrated with teaching and learning processes, with a higher mean score (Mean = 3.53, SD = 0.77) compared to all other emerging technologies. This is the sign of a promising trend for curriculum update. Moreover, relevance and integration of technology with industry received the top score (Mean = 3.68, SD = 0.68), highlighting, once again, that industry needs are met with very tailor-made courses in response to the technological penetration in the industries in the region. The respondents highly agreed to these statements, given the typical small variability in responses. As a consequence, although the adequacy of infrastructure such as computer labs and high-speed Internet emerged as an essential challenge (Mean = 2.09, SD = 0.85). This implies that most institutions do not have the minimal structure needed to enable effective technology incorporation. Also, technology use in teaching by lecturers was rated less than average (Mean = 2.50, SD = 0.92), which means that is an important area for focused professional development and training programs.

Research Question 2: To what extent do industry stakeholders perceive business education graduates as adequately skilled and competent?

Table 2: Extent to which industry stakeholders perceive business education graduates as adequately skilled and competent

S/N	Statements	Mean	SD
1	Business education graduates possess adequate technical skills required to meet industry demands.	3.06	1.05
2	Business education graduates demonstrate strong problem-solving and critical-thinking abilities in workplace scenarios.	3.18	0.94
3	Business education graduates are proficient in utilizing modern technological tools relevant to industry operations.	3.43	0.78
4	Business education graduates exhibit effective communication and interpersonal skills essential for the workplace.	3.50	0.73
5	Business education graduates have a solid understanding of contemporary industry trends and practices.	3.37	0.84
6	Business education graduates are adequately prepared to adapt to the dynamic needs of the modern business environment.	3.41	0.96

Table 2 reveals that business education graduates in Southwest Nigeria are generally perceived to be ready to accommodate the labor market demand within the industries on technical, cognitive, technological, and interpersonal competencies. With a mean of 3.06 and SD of 1.05, technical skills of graduates from Business education are relatively moderate suggesting that somewhat familiar with some of these competencies, but not fully aligned with industry expectations. This is also backed up by the rating of graduates' problem-solving and critical-thinking abilities that were rated even slightly higher (Mean = 3.18, SD = 0.94). These data indicate that more rigorous curriculum elements focused on the development of these foundation skills are warranted. The graduates scored a relatively strong score (Mean = 3.43, SD = 0.78) in their proficiency in using modern technological tools, which would reflect that there is a reasonable level of technological competence. This also correlated with their perceptions of current industry trends and practices and was rated positively (Mean = 3.37, SD = 0.84). These findings suggest that technical skills do exist, although consistent curriculum updates to reflect current advancements incidences can potentiality provide graduate aptitude. One point worthy of attention from the former was the fact that interpersonal and communication skills was a notable strength for this group, as shown by the graduates scoring high (Mean = 3.50, SD = 0.73) in this area. It means those entrants are

already well-versed in these important workplace skills, which serve as a valuable foundation in any work environment. Their quality of adaptability to the changing requirements of modern business settings, too, scored favorably (Mean = 3.41, SD = 0.96), indicating their readiness to evolve with changing industry needs.

Research Question 3: What are the key challenges educational institutions face in adopting and integrating technology into their teaching practices?

Table 3: Challenges educational institutions face in adopting adopting and integrating technology into their teaching practices

S/N	Statements	Mean	SD
1	Inadequate funding is a major barrier to adopting and integrating technology into teaching practices in educational institutions.	3.68	0.68
2	Limited access to reliable internet connectivity significantly hinders the integration of technology into teaching practices.	3.50	0.73
3	The lack of adequately trained educators in emerging technologies is a significant challenge to technology adoption in teaching.	3.38	0.91
4	Erratic power supply negatively impacts the effective use of technology in teaching practices.	3.50	0.84
5	Resistance to change among educators and administrators prevents the successful integration of technology into teaching.	3.58	0.73
6	The absence of clear policies and strategies for technology adoption creates challenges for its integration into teaching practices.	3.60	0.75

The above data highlights some of the most significant challenges to the admission and incorporation of technology into business education programmes in Universities in South west Nigeria. .Inadequate funding (Mean = 3.68, SD = 0.68), was identified as the biggest challenge. This underscores the urgency of investing in more funding for the purchase and maintenance of technology, infrastructure, and training programs. The low standard deviation indicates a strong consensus among respondents on the matter. Both limited access to reliable internet connectivity and erratic power supply received moderately-high scores each (Mean = 3.50), indicating infrastructure deficiencies as significant impediments. Such issues detrimentally impact not only the integration of technology but also the effectiveness of teaching practices using digital tools. The greater variability in responses for power supply (SD = 0.84), compared to internet connectivity (SD = 0.73) perhaps reflects differences in infrastructure at regional (if not national) levels. Absence of sufficiently trained teachers in new technology (Mean = 3.38, SD = 0.91) is another barrier. This demonstrates the importance of professional development programs to train business education teachers on how to employ technology in classrooms. Responses were variable, indicating potential differences in current training availability between institutions. The other two major challenges were resistance of educators and administrators towards change (Mean = 3.58, SD = 0.73) and the lack of clear policies and plans for technology adoption (Mean = 3.60, SD = 0.75). These results are set to the cultural and organizational confines that require addressing a need for raised awareness, guidance through leadership training and creating a thorough technology integration policy.

Research Question 4: What strategies can be employed to foster effective collaboration between educational institutions and industries in leveraging technology for skill development?

Table 4: Indicating strategies can be employed to foster effective collaboration between educational institutions and industries in leveraging technology for skill development

S/N	Statements	Mean	SD
1	Educational institutions should establish formal partnerships with industries to create technology-driven skill development programs.	3.53	0.86
2	Collaborative workshops and seminars between industry professionals and educators are essential for aligning curriculum with industry needs.	3.61	0.75
3	Industries should provide financial support or grants to educational institutions to develop technology-based training facilities.	3.30	1.02
4	A joint committee involving representatives from both educational institutions and industries would improve the quality and relevance of technology-based skill development programs.	3.46	0.89
5	Educational institutions should integrate real-world industry projects into their curriculum to enhance students' practical skills in technology.	3.45	0.90
6	Industries should offer internships and hands-on experience opportunities for students to enhance their technical skills in a real-world setting.	3.60	0.76

The information provided in table 4 emphasizes the perceived need for cooperation between educational institutions and industries in improving technology-based skill development programs. From these responses, we see a strong demand for partnerships, experiential learning opportunities, and funding to close the gap between education and industry needs. Industry-academic joint workshops & seminars are widely regarded as crucial initiatives for ensuring an industry alignment of curricula (Mean = 3.61, SD = 0.75). This high rating highlights the need for constant communication between academia and industry to guarantee that academic programs are relevant and effective. Internships and hands- on experience opportunities provided by industrial sectors (Mean = 3.60, SD = 0.76) are also mentioned as very important in giving students real exposure and technological skills. Such formal partnerships wherein industries join forces with educational institutions to devise technology-oriented skill development programs received a fairly favourable rating (Mean = 3.53, SD = 0.86). These partnerships are key to creating programs that align with industry needs, now and in the future. (Intermediate standard joint committee to facilitate cooperation, mean = 3.46, SD = 0.89), yet highly indicative of the structural soul-searching across both sectors to leverage collaboration to enhance relevance and quality of program quality. Industry projects in real-world (Mean = 3.45, SD = 0.90) are viewed as the most vital method in preparing students with practical experience marking students able to fulfil their industrial roles. Students can bridge the gap between theory and practice, engage in critical thinking and solve real problems through this approach. The idea that industries should allocate funding or grants for educational institutions to work toward establishing technology-based training facilities was rated slightly lower (Mean = 3.30, SD = 1.02), suggesting a divergence of agreement or skepticism regarding such financial commitments being possible.

Research Question 5: How does improved technology adoption influence graduate employability and industry competitiveness in Southwest Nigeria?

Table 5: Improved technology adoption influence graduate employability and industry competitiveness in Southwest Nigeria?

S/N	Statements	Mean	SD
1	How much do you agree that technology adoption has improved the employability of graduates in Southwest Nigeria?	3.64	0.64
2	To what extent has the adoption of technology in industries	3.39	1.00
3	Graduates with technology skills have a higher likelihood of securing employment in Southwest Nigeria than those without such skills.	3.50	0.83
4	The adoption of advanced technology in industries in Southwest	3.30	1.02
5	Technology adoption in businesses has significantly increased their ability to compete in the global market.	3.50	0.84
6	The technological skills of graduates directly influence their ability to drive innovation and enhance the competitiveness of industries in Southwest Nigeria.	3.68	0.68

Table 5 presents the study respondents' perceptions about the impact of technology adoption on graduate employability and industrial competitiveness in Southwest Nigeria. The responses illustrate the value of tech skills—both for individual and enterprise success in a quickly-evolving economy. It has also been observed that the utilization of technology significantly increases the Employability of the Graduates (Mean = 3.64, SD = 0.64). It is rated so highly and with such low variability, because there is a strong consensus that tech skills give graduates a better chance at finding work in the job market. Equally, graduates possessing skills in technology are seen by employers to be in a prime position to secure employment over their counterparts who do not possess those skills (Mean = 3.50, SD = 0.83). These findings highlight the business-critical importance of technology as a catalyst for employability and career opportunity. One of the factors that boosts the competitiveness of firms in Southwest Nigeria is technological adoption. Businesses are more capable of competing on the global marketplace, owing to the advance of technology (Mean = 3.50, SD = 0.84). Besides, the role of graduates' technological expertise in facilitating innovation and enhancing industrial competitiveness was rated most critically (Mean = 3.68, SD = 0.68), underscoring the necessity to furnish the workforce with state-of-the-art competencies. The perceived extent of technology adoption to enable industry to compete locally was rated somewhat lower (Mean = 3.39, SD = 1.00) indicating inconsistencies in value within sectors or among firms. Moreover, although it was acknowledged that advanced technology creates more job prospects for graduates (Mean = 3.30, SD = 1.02), the score was still moderately agreed upon, perhaps due to the incidence of jobs in some areas compared to others.

Discussion of Findings

These results offer valuable information regarding the inclusion of technology in business education, the readiness of graduates, the challenges witnessed, the function of academia-industry collaboration, as well as the influence of technology adoption on employability and industrial competitiveness within Southwest Nigeria. These findings are consistent with those in the literature but provide a contextual interpretation. With regard to the blending of technology into business education curricula, its implementation was found to be moderate with specific focus on integration of emergent technologies, such as AI, and Cloud computing. This finding is consistent with those conducted by Obara and Okon (2020), which states that the introduction of advanced technologies to universities' curriculum will make the academic curriculum relevant. However, many deficiencies persist, especially regarding infrastructure and lecturers' capacity. These barriers are in keeping with findings from Okeke Oladimeji and Ogundele (2019) were identified as

continuing issues in Nigeria's educational facilities plagued by poor infrastructure and inadequate training. Bridging these gaps necessitates strategic investments and the development of professional development programs to enhance the quality of educational delivery. Graduates were found to be relatively well-prepared in relation to communication and technology skills; however, these were reported to be relatively weaker in terms of technical and problem-solving skills. This is in agreement with the study of Olufemi and Adetola (2021) that concludes Nigerian graduates have good communication skills but poorly equipped with technical skills for the industry. According to Johnson (2018), bridging this gap through incorporating real-world projects into the curriculum and encouraging critical thinking would facilitate the pooling together of graduates' abilities with the industry's expectations.

Technology adoption in teaching practices was challenged on all fronts, including (but not limited to) funding constraints, poor internet access, and erratic power supply. These findings were in line with the research of Iwu and Nzeadibe (2020) who observed that systemic infrastructural deficiencies act as a blockade to effective technology adoption in educational rooms in Nigeria. This further confirms the findings of Eze (2020), emphasizing the roles of institutional support and strategic frameworks in overcoming such challenges. Findings showed the importance of academia-industry collaboration, identifying workshops, internships and joint committees as the key enablers towards curriculum relevance and skills development. Adebayo and Oluwole, (2022). also make a case for structured collaborations between academia and the industry which can go a long way to deepening graduate employability, and driving innovation The somewhat diminished focus on industries providing financial support, however highlights a need for sustainable funding models (Johnson & Akinyemi, 2019).

It also demonstrated that technology adoption is heavily correlated with improved graduate employability and industrial competitiveness. Graduates with technological know-how were thought to stand in good stead to gain employment and stimulate innovation across sectors. This adds to the literature by Iwu and Nzeadibe (2020) who emphasize technology's transformative power in producing a knowledgeable workforce and increasing global competitiveness. The moderate consensus on job creation indicates that the effects of technology adoption may differ across sectors, which was also pointed out by Okonkwo (2019), These findings are consistent with the literature on the importance of technology in education and industry. Overcoming the aforementioned challenges and bridging the gaps between academia and industry will go a long way in ensuring that we harness technology the way it was meant to be. These strategies will help ensure that graduates possess the skills required to succeed in a rapidly changing and tech-laden global economy.

Conclusion

The study highlights the importance of technology in determining the quality of business education, graduate employability, and industrial competitiveness in Southwest Nigeria. Despite these advancements in technology for education, issues such as lack of resources and funds and the scarcity of trained professionals prevent institutions from fully harnessing the potential of these technologies.

Recommendations

1. Governments and educational institutions must prioritize investments in infrastructure: in high speed internet access, computer labs, and a reliable power supply.
2. Then curricula in educational institutions need to be designed to focus on technical and practical skills.
3. Educational institutions should work with industries to act formally and set up technology-based skill development programs.

4. Continued support for adopting technology in education, especially by governments and regulatory bodies, would require well defined policies and strategies.
5. In terms of practical aspects, industries need to invest in providing monetary support, internships, and hands-on training opportunities to educational institutions and students.
6. Educators and administrators are resistant to change, suggesting the need for awareness campaigns and leadership training programs.

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EXAMINING THE CONNECTION BETWEEN PERSONALITY TRAITS AND ART PREFERENCE OF SELECTED ADULTS IN LAGOS STATE, NIGERIA

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ABSTRACT

This study investigated the relationship between personality traits and art preferences among adults in Lagos, Nigeria. The research examined how the Big Five personality traits (Openness, Conscientiousness, Extraversion, Agreeableness, and Neuroticism) correlate with preferences for various art styles, including abstract, pop art, surrealism, and digital art. Additionally, the study explored the potential influence of demographic factors such as ethnicity, gender, and age on these relationships. A sample of 378 participants completed the International Personality Item Pool (IPIP) and an art preference questionnaire. The study employed a cross-sectional survey design, and data were analyzed using Pearson correlations, One-Way ANOVA, and descriptive statistics. Contrary to previous research conducted primarily in Western contexts, this study found no significant correlations between personality traits and art preferences. Openness to Experience showed no significant relationship with preferences for abstract ($r = .053$, $p = .305$) or surrealist art ($r = -.017$, $p = .736$). Similarly, Neuroticism did not significantly correlate with preferences for surrealism ($r = -.043$, $p = .409$) or abstract art ($r = -.082$, $p = .111$). The study also found no significant ethnic differences in art preferences for surrealism ($F(3, 374) = 0.691$, $p = .558$) or pop art ($F(3, 374) = 2.340$, $p = .073$). These findings challenge established theories and previous research on the relationship between personality traits and art preferences.

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Keywords: Personality Traits, Art Preference, Art

Introduction

Art has become a major driving tool for social and economic development globally and the The need for art is on the increase as young people and older citizens are getting more fascinated with the works of art, such that it has become one of the selling points of tourism in the world in the last few decades. Africa in particular Nigeria has witnessed a massive

inflow of people to its land in the name of art. The diversity and interest that come with the work of art have made several researchers in the field of behavioural sciences examine the role of personality in the art preferences of young people. Art is one of the many activities (playing sports, having picnics or going fishing etc) that we prefer to do so that we can move away from discipline-required daily work and relations. Many people are involved in arts to get rid of the tiredness in their life, some people take painting, music, marbling, calligraphy and dance lessons from hobby courses while some others are more passive and only prefer to follow artistic activities as they are shy or cannot find enough time. The importance and priority of art to a person can vary. While some people want to be informed about artistic activities, they spend time and money for them, some others are only interested in artistic activity when they come across and they do not spend money for it. However, some people regard going to galleries, learning about artists, following hobby courses and the date of concerts or theatres as are waste of time. Apart from those who do not let art be involved in their life, people who are slightly interested in art vary according to their art preferences. Whether the preferences, of which motto, “there is no accounting for tastes ', are related to art education, art history, parenting education and personality besides the art experience or not is one of the big questions for every field.

The intersection of personality traits and art preferences has garnered significant interest in psychological and artistic domains. Researchers like (Furnham &Walker 2001a: Furnham &Walker 2001b) have sought to understand how individual differences in personality influence aesthetic preferences and engagement with various art forms. Personality traits, often measured using instruments such as the Big Five Inventory (BFI) or the HEXACO Personality Inventory, encompass dimensions like Neuroticism, Agreeableness, Conscientiousness, Extraversion, and Openness to Experience. These traits provide a comprehensive framework for analyzing individual differences in behaviour, including preferences for different art styles. Art preferences themselves are multifaceted, encompassing a range of styles from abstract and pop art to European and Japanese representational art. Each style offers unique aesthetic and thematic elements that can appeal to different personality profiles. These insights are crucial for both psychological theory and practical applications in areas such as art therapy, marketing, and cultural policy.

The study of art preferences has roots in the broader field of aesthetics, a branch of philosophy concerned with the nature of beauty and artistic taste. Early philosophers like Immanuel Kant and David Hume debated the subjective and objective dimensions of aesthetic judgment, laying the groundwork for contemporary psychological research. In the 20th century, psychologists like Eysenck (Eysenck, 1992) began to empirically investigate the links between personality traits and aesthetic preferences, using psychometric tools to quantify individual differences in art appreciation. The contemporary landscape of research on personality and art preferences is marked by methodological advancements and a growing emphasis on empirical evidence. Studies now employ a variety of methods, including self-report questionnaires, experimental designs, and neuroimaging techniques, to explore the cognitive and emotional processes underlying art preferences. This methodological diversity enriches the field, providing a more nuanced understanding of how personality traits shape aesthetic experiences.

All the aspects of personality traits thus contribute, Openness to experience has been emphasized as the factor most about aesthetic preference. According to McCrae and Costa (1997), “artists can be seen as exemplars of Openness just as neurotics are exemplars of Neuroticism”. Openness has been linked to liking polygons self-rated as both “complex” and “meaningful” (Rawlings et al., 1998). Furnham and Avison (1997) found a link between openness and preference for representational art, particularly pictures with few elements. Rawlings et al. (2000) found that openness was associated

with a preference for “erotic-abstract” and a dislike of neutral-realistic paintings. Furnham and Walker (2000) found that openness was positively correlated with a preference for abstract, pop art and representational paintings. Preference for abstract and pop art paintings (Furnham & Walker, 2000). Previous research regarding extraversion (E) and preference has been equivocal. Eysenck (1941) suggested a positive link between E and liking of modern art, but Cardinet, 1958, Furnham and Avison, 1997 found a negative relationship. Furnham and Walker found no relationship between the trait and liking of abstract, pop art or representational art. Results indicated that individuals with traits of extraversion and openness to experience preferred surrealist works, while those with traits of tendermindedness preferred Impressionist art (Feist & Brady, 2004). Furnham and Avison (1997) found a positive correlation between agreeableness and liking for representational paintings. Furnham and Walker (2000) found a negative relationship between agreeableness and preference for pop art. Conscientiousness was not found to be linked to any aspect of artistic preference by Furnham and Avison, but Furnham and Walker found a positive correlation between conscientiousness and the liking of representational paintings. Moreover, the study of art preferences extends beyond psychological traits to encompass broader cultural and societal influences. Art serves as a medium for expressing cultural values, historical narratives, and social issues.

As such, preferences for certain art styles can be influenced by cultural background, socialization processes, and exposure to different artistic traditions. This cultural dimension adds another layer of complexity to the relationship between personality and art preferences, necessitating a comprehensive approach that considers both individual and cultural factors. The integration of personality and art preference research also aligns with the growing interest in interdisciplinary studies. Combining insights from psychology, art history, cultural studies, and aesthetics allows for a richer understanding of how people interact with and derive meaning from art. This interdisciplinary approach can reveal how art functions as a form of communication, a tool for emotional regulation, and a means of identity expression. In practical terms, understanding the relationship between personality traits and art preferences has significant implications for various fields. In education, insights from this research can inform the development of art curricula that cater to diverse student interests and promote engagement with different art forms. In therapy, personalized art interventions based on personality profiles can enhance therapeutic outcomes by aligning clients' aesthetic preferences and emotional needs.

In marketing, businesses can use personality-driven strategies to create more effective advertising campaigns and product designs that resonate with their target audiences. Furthermore, the digital age has transformed how people interact with art, with social media and online platforms playing a crucial role in shaping art consumption patterns. Online galleries, virtual museums, and social media channels offer unprecedented access to a diverse array of art forms, influencing individual preferences and broadening exposure to different artistic styles. This digital context adds another dimension to the study of art preferences, highlighting the need to consider the impact of technology and digital media on aesthetic experiences. A study by Siyanbade (2023) identified the various modes of job creation and empowerment of youths and adults, the study emphasised the importance to youth empowerment for economic growth, the use of arts can support the growth and development of young people.

The literature on personality and art preferences also points to the potential for cross-cultural research. findings of the study clearly indicates that children should engage with artworks, reflect upon their experiences with artworks, value their experiences with artworks and appreciate its beautyWhile much of the existing research has focused on Western populations, there is a growing recognition of the importance of exploring these relationships in diverse cultural settings.

Cross-cultural studies can uncover universal patterns as well as culturally specific influences on art preferences, contributing to a more global understanding of aesthetic appreciation. Historically, the study of art preferences has roots in the broader field of aesthetics, a branch of philosophy concerned with the nature of beauty and artistic taste. Early philosophers like Immanuel Kant and David Hume debated the subjective and objective dimensions of aesthetic judgment, laying the groundwork for contemporary psychological research. A study by Akinwale (2024) states that folktales serves as an art and a powerful too for the development of individuals, as children are developing the non-visual art performances like storytelling, singing, and drama among others to guide their development. In the 20th century, psychologists like Eysenck and Cattell began to empirically investigate the links between personality traits and aesthetic preferences, using psychometric tools to quantify individual differences in art appreciation. The contemporary landscape of research on personality and art preferences is marked by methodological advancements and a growing emphasis on empirical evidence. Studies now employ a variety of methods, including self-report questionnaires, experimental designs, and neuroimaging techniques, to explore the cognitive and emotional processes underlying art preferences. This methodological diversity enriches the field, providing a more nuanced understanding of how personality traits shape aesthetic experiences.

Statement of the Problem

The motivation behind this study arises from the observed gap in comprehensive empirical data linking personality traits with specific art preferences. While existing literature provides some insights, there is a lack of cohesive research that integrates multiple personality dimensions with a wide range of art styles. This gap hinders our ability to fully understand how personality influences aesthetic choices and the underlying mechanisms driving these preferences. Moreover, the existing studies often focus on Western populations, limiting the generalizability of findings to other cultural contexts. This study seeks to address these limitations by incorporating diverse demographic samples and exploring how personality traits shape art preferences. Understanding these relationships is not only academically significant but also has practical implications for art educators, therapists, and marketers who can tailor their approaches based on personality profiles.

Objectives of the Study

The primary objective of this study is to investigate the relationship between personality traits and art preferences across different cultural contexts. Specifically, the study aims to: (a) examine which personality traits are most strongly associated with preferences for specific art styles (e.g., abstract, pop art, European representational, Japanese representational). (b) examine the role of religious background in moderating the relationship between personality traits and art preferences. (c) To examine sex and age difference influences on art preferences

Literature Review

Pop Art

Pop Art emerged in the mid-20th century as a vibrant and dynamic movement that challenged traditional notions of fine art by incorporating imagery from popular culture. This movement began in the 1950s and gained prominence in the 1960s, primarily in the United States and the United Kingdom. It was characterized by its use of imagery from advertising, comic books, mundane cultural objects, and mass media, blurring the boundaries between high art and everyday life.

Key figures in the Pop Art movement include Andy Warhol, Roy Lichtenstein, James Rosenquist, and Richard Hamilton. Warhol's works, such as his famous Campbell's Soup Cans and portraits of Marilyn Monroe, utilized repetitive imagery to reflect and critique the consumerist culture of the time. Lichtenstein's comic strip-inspired paintings, like "Whaam!" and "Drowning Girl," used Ben-Day dots and speech balloons to elevate the aesthetic of commercial art into the realm of high art.

Pop Art was not only a visual art movement but also a cultural commentary. It responded to the post-war economic boom and the rise of consumerism, exploring themes of commodification, mass production, and the banalization of culture. The embrace of irony and parody highlighted the pervasive influence of advertising and media, often questioning the authenticity and originality of art in a mass-produced society. Pop Art's impact extended beyond painting and sculpture to include fashion, music, and graphic design. Its bold colours, clear lines, and incorporation of recognizable imagery made it highly accessible and influential, leading to a broader democratization of art. The movement paved the way for later developments in contemporary art, including the appropriation art of the 1980s and the continued exploration of consumer culture in the digital age.

Abstract Expressionism (The study focuses on Lagos, Nigeria, but the discussion of art movements like Pop Art, Abstract Expressionism, and Surrealism is heavily Western-centric. It would be beneficial to include more context about how these art movements are perceived and engaged with in Nigeria. Additionally, discussing local Nigerian art movements and their influence on the participants could provide a richer cultural context. Abstract Expressionism, which emerged in the 1940s and 1950s, is often regarded as the first major American art movement to gain international influence. It emphasized spontaneous, automatic, or subconscious creation, allowing artists to express their inner emotions and personal experiences through abstract forms and gestural brushwork.

The movement is divided into two main tendencies: Action Painting, exemplified by Jackson Pollock, and Color Field Painting, represented by artists like Mark Rothko and Barnett Newman. Pollock's technique of dripping and splattering paint onto canvases laid on the ground, as seen in works like "Autumn Rhythm" and "No. 5, 1948," broke away from traditional painting methods and introduced a new way of engaging with the medium. His dynamic, all-over compositions reflected the energy and chaos of modern life. Colour Field Painting, on the other hand, focuses on large expanses of colour and simple, unified compositions. Rothko's luminous rectangles of colour, such as those in "No. 61 (Rust and Blue)" and "White Center (Yellow, Pink and Lavender on Rose)," aimed to evoke deep emotional responses through their simplicity and intensity. Newman's works, characterized by vertical "zips" of colour, explored the relationship between form and space, as seen in "Vir Heroicus Sublimis."

Digital Art

Digital art encompasses a broad range of artistic practices that use digital technology as an essential part of the creative process. Since its emergence in the late 20th century, digital art has evolved alongside advancements in computer technology, offering artists new tools and platforms for expression.

Digital art includes various forms such as digital painting, 3D modelling, animation, interactive installations, and virtual reality (VR) art. Pioneering digital artists like Nam June Paik and Harold Cohen explored the potential of computers and video technology in the 1960s and 1970s. Paik, known as the "father of video art," used television screens and video synthesizers to create works like "Electronic Superhighway," which commented on the cultural impact of mass media.

In the realm of digital painting, artists use software such as Adobe Photoshop, Corel Painter, and Procreate to create works that mimic traditional painting techniques or explore entirely new aesthetics. The accessibility of digital tools has democratized the creation and distribution of art, allowing a broader range of artists to share their work globally through online platforms and social media. 3D modelling and animation have revolutionized fields such as film, video games, and virtual reality. Artists like Pixar Animation Studios have pushed the boundaries of digital animation, creating visually stunning and emotionally compelling narratives. VR art, meanwhile, offers immersive experiences that allow viewers to interact with and explore virtual environments, challenging traditional notions of spectatorship and engagement.

Digital art also intersects with other disciplines, including graphic design, illustration, and web design. The rise of NFTs (non-fungible tokens) has further transformed the digital art landscape, providing new opportunities for artists to monetize their work and for collectors to own unique digital assets. The future of digital art is closely tied to ongoing technological advancements, including artificial intelligence (AI), machine learning, and augmented reality (AR). These technologies promise to expand the possibilities for creativity and interaction, continuing to reshape the art world in profound ways.

Surrealism

Surrealism, which emerged in the early 20th century, sought to unleash the creative potential of the unconscious mind by transcending the boundaries of rational thought and everyday reality. Inspired by the psychoanalytic theories of Sigmund Freud, Surrealist artists aimed to explore dreams, fantasies, and the inner workings of the psyche.

André Breton, a French poet and critic, is often credited with founding the Surrealist movement. His “Manifesto of Surrealism,” published in 1924, outlined the principles of the movement and emphasized the importance of automatism—a technique aimed at bypassing conscious control to access deeper layers of the mind.

Key figures in Surrealism include Salvador Dalí, René Magritte, Max Ernst, and Joan Miró. Dalí’s meticulously detailed paintings, such as “The Persistence of Memory” and “The Elephants,” depict bizarre and dreamlike scenes that challenge conventional perceptions of reality. Magritte’s works, like “The Treachery of Images” and “The Son of Man,” play with visual puns and paradoxes, questioning the relationship between images and meaning.

Surrealist artists employed various techniques to tap into the unconscious, including automatic drawing, collage, frottage (rubbing), and decalcomania (a blotting process). These methods allowed for spontaneous and unplanned compositions that revealed hidden thoughts and desires.

The movement’s influence extended beyond visual art to literature, film, and theater. Surrealist writers like André Breton and Louis Aragon experimented with automatic writing, while filmmakers such as Luis Buñuel and Jean Cocteau created films that defied narrative conventions and explored the logic of dreams.

Surrealism’s legacy is evident in contemporary art and culture, particularly in its emphasis on the irrational and the uncanny. It has inspired later movements such as Abstract Expressionism, Pop Art, and Neo-Surrealism, and continues to resonate with artists who seek to explore the mysteries of the human mind.

Cubism

Cubism, pioneered by Pablo Picasso and Georges Braque in the early 20th century, revolutionized the way artists represented space, form, and perspective. This movement, which emerged around 1907, broke away from traditional linear perspective and naturalistic depictions, instead fragmenting objects into geometric shapes and reassembling them in abstract compositions.

Cubism is generally divided into two phases: Analytical Cubism and Synthetic Cubism. Analytical Cubism, developed between 1908 and 1912, involved the deconstruction of objects into their basic geometric components, often resulting in monochromatic and highly abstract images. Picasso's "Les Demoiselles d'Avignon" and Braque's "Violin and Candlestick" exemplify this approach, with their fragmented forms and multiple viewpoints. Synthetic Cubism, which emerged around 1912, introduced brighter colours and incorporated collage elements such as newspaper clippings, patterned paper, and other materials. This phase marked a shift towards more playful and decorative compositions. Picasso's "Still Life with Chair Caning" and Braque's "Bottle and Fishes" are notable examples of Synthetic Cubism, demonstrating the movement's innovative use of mixed media and assemblage.

Cubism's radical departure from traditional representation had a profound impact on modern art, influencing a wide range of subsequent movements, including Futurism, Constructivism, and Surrealism. Its emphasis on abstraction and the breakdown of form challenged artists to reconsider the nature of perception and representation. The movement also intersected with developments in other disciplines, such as literature and architecture. Writers like Gertrude Stein experimented with fragmented narrative structures, while architects like Le Corbusier drew inspiration from Cubist principles in their designs, emphasizing geometric forms and functionalism.

Theoretical review

Big Five Personality Traits

The Big Five Personality Traits, also known as the Five-Factor Model (FFM), is a widely accepted framework in psychology that categorizes personality into five broad dimensions: Openness to Experience, Conscientiousness, Extraversion, Agreeableness, and Neuroticism (Goldberg, 1990). This model is particularly relevant to studies of aesthetic preferences as it posits that certain traits, like Openness to Experience, are closely associated with a greater appreciation for novel, complex, and unconventional forms of art, such as abstract and surrealist styles (Costa & McCrae, 1992).

Research has shown that individuals with high Openness are more likely to appreciate art that challenges traditional norms and conventions, including abstract expressionism and surrealism (Silvia, 2005). This dimension is crucial for understanding why some people are drawn to non-traditional forms of art, which often evoke a wide range of interpretations and emotional responses. The core of this study's theoretical framework is the Big Five Personality Theory, also known as the Five-Factor Model (FFM). Developed by researchers such as Costa and McCrae (1992), this model posits that personality can be described along five broad dimensions:

- Openness to Experience: Reflects curiosity, creativity, and willingness to try new things.
- Conscientiousness: Indicates organization, dependability, and self-discipline.
- Extraversion: Represents sociability, assertiveness, and energy.
- Agreeableness: Reflects compassion, cooperation, and trust in others.
- Neuroticism: Indicates emotional instability and tendency towards negative emotions.

This theory provides a comprehensive and widely accepted framework for understanding individual personality differences. In the context of art preferences, the Big Five model offers a structured approach to examining how fundamental personality traits might influence aesthetic choices.

Aesthetic Preference Theory

Aesthetic Preference Theory explores the cognitive and emotional processes that underlie people's judgments of beauty and artistic quality. This theory integrates aspects of perceptual fluency, emotional response, and cultural learning to explain why certain visual stimuli are preferred over others. It suggests that familiarity, ease of processing, and positive affective responses are key determinants of aesthetic preference (Reber, Schwarz, & Winkielman 2004). This theory is particularly relevant in understanding the appeal of different art styles. For example, abstract art, which often lacks clear representational content, can elicit varied responses based on an individual's perceptual fluency and prior exposure to such art. Familiarity with abstract forms can enhance aesthetic appreciation, while unfamiliarity may lead to discomfort or disinterest. Building on the work of Berlyne (1971) and later researchers like Reber et al. (2004), Aesthetic Preference Theory suggests that individuals' preferences for visual stimuli are influenced by factors such as complexity, novelty, and familiarity. This theory proposes that aesthetic preferences are shaped by a combination of cognitive processing fluency and arousal potential.

Method

This study investigated the relationship between personality traits which include Openness to Experience, Conscientiousness, Extraversion, Agreeableness, and Neuroticism and how they are responsible for art preference for culturally diverse Lagos. The research was conducted in multiple settings to ensure the diversity and representativeness of the sample. The primary settings include universities, art galleries, and community centers in urban areas in Lagos Nigeria during a world record art event and art exhibitions. Links were sent to each participant via QR code scanning for ease of collecting data in an active environment.

Population/Sample and Sampling Procedures

The population sample size of 378 participants. The gender distribution indicates that 38.6% of the participants are male (n = 146), while 61.4% are female (n = 232). The age distribution shows that 27.0% of the participants are between 16-20 years old (n = 102), 41.3% are between 21-25 years old (n = 156), 16.4% are between 26-30 years old (n = 62), and 15.3% are between 31-35 years old (n = 58). In terms of ethnicity, 71.2% of the participants are Yoruba (n = 269), 6.6% are Igbo (n = 25), 12.2% are Hausa (n = 46), and 10.1% are from other ethnic groups (n = 38). Regarding religion, 75.1% of the participants identify as Christian (n = 284), 17.5% as Muslim (n = 66), and 7.4% practice traditional religions (n = 28).

Participants were recruited from campuses and art exhibitions centers, social media, and community outreach. Inclusion criteria include being within the specified age range and having some exposure to visual art (either through education or personal interest). Exclusion criteria include professional artists or art critics to avoid bias from professional expertise.

Research Design

The study used a cross-sectional survey design to investigate the relationships between personality traits, gender, and art preferences. This design allows for the collection of data at a single point in time, facilitating the examination of associations and potential moderating effects of personality traits.

Instruments

Personality Traits Measurement:

Personality traits will be assessed using the Big Five Inventory (BFI), which measures the five major dimensions of personality: Neuroticism, Agreeableness, Conscientiousness, Extraversion, and Openness to Experience. This study utilized the International Personality Item Pool (IPIP) to assess personality traits. The IPIP comprises 50 items measuring extraversion, agreeableness, conscientiousness, emotional stability (low neuroticism), and openness to experiences. Each item is rated on a five-point Likert scale with responses on a 5-point Likert scale ranging from "Strongly Disagree" to "Strongly Agree.", and the internal consistencies of these factors are typically high, averaging .84. This study involved a diverse sample of participants who were asked to rate their preferences for various artwork.

Art Preferences Measurement:

Art preferences will be measured using a structured questionnaire developed for this study. The questionnaire included items related to various art styles, such as abstract, pop art, digital art, cubism and surrealism Art. Participants will rate their preference for each style on a 5-point Likert scale ranging from "Strongly Dislike" to "Strongly Like."

Artworks used

Abstract art by Mark Rothko, "Orange, Red and Yellow"

Digital art by Tobi Stephen, Golden

Surreal art by Joan Miro, Harlequin's Carnival

Pop art by David Hockney, Portrait of an Artist (Pool with Two Figures)

Section A

The first section, Section A, asked questions on demographic information which includes; gender,

age, religion, level, ethnicity, and faculty.

The first variable, gender, is classified as male and female.

The second variable, age, is classified as 16-20 years; 21-25 years; 26-30 years; 31-35 years; 36

years and above. The third variable, religion, is classified as Christianity, Islam, and Traditional religion. The fourth variable, ethnicity, is classified as Yoruba, Hausa, Igbo, and Others.

Section B

This study utilized the International Personality Item Pool (IPIP) to assess personality traits. The IPIP comprises 50 items measuring extraversion, agreeableness, conscientiousness, emotional stability (low neuroticism), and openness to experiences. Each item is rated on a five-point Likert scale with responses on a 5-point Likert scale ranging from "Strongly Disagree" to "Strongly Agree.", and the internal consistencies of these factors are typically high, averaging .84.

Section C

Here is a selection of art representing 5 different genres

Artworks used

Abstract art by Mark Rothko, "Orange, Red and Yellow"

Digital art by Tobi Stephen, Golden

Surreal art by Joan Miro, Harlequin's Carnival

Pop art by David Hockney, Portrait of an Artist (Pool with Two Figures)

Participants will rate their preference for each style on a 5-point Likert scale ranging from “Strongly Dislike” to “Strongly Like.”

Procedure

Before initiating the research, the researcher identified the independent and dependent variables and selected standardized instruments to accurately measure these variables. The study involved undergraduate students from the University of Lagos, situated in Akoka and attendees of the Guinness world record attempt by Dr. Fola David in Onikan stadium, Lagos. Data collection was conducted offline using an online Google Forms questionnaire. The researcher approached 400 participants and obtained consent from each. Participants were assured that their responses would remain strictly confidential and anonymous, and they were encouraged to respond honestly. After obtaining consent, the researcher provided clear instructions for each section of the questionnaire to ensure participants understood the tasks and could perform them effectively. To promote a comfortable environment and encourage honest responses, the researcher established a rapport with the participants before administering the questionnaires. Participants then completed online Google Forms questionnaires, and upon completion, the researcher securely stored the completed questionnaires in an Excel sheet.

Data Analysis

The data gathered from the questionnaires were entered into the Statistical Package for Social Sciences (SPSS), version 26, for analysis. Both descriptive statistics (means, standard deviations, frequencies, and percentages) and inferential statistics (Linear Regression, Independent Sample t-test, and One-way Between-Group ANOVA) were utilized. Linear Regression was used to test hypothesis 1, the Independent Sample t-test was used for hypothesis 2, and One-way Between-Group ANOVA was employed for hypothesis 3. The study maintained a significant level of $p = 0.05$.

Results

Demographic Description of Respondents

The sample for this study comprised students and individuals in art exhibitions in Lagos, Akoka. A total of 378 questionnaires were distributed and completed. The demographic distribution of the respondents, along with other assessed variables, are detailed below:

Table 1: Descriptive Statistics for Demographic Data

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Gender	378	1	2	1.61	.488
Age	378	1	4	2.20	1.005
Ethnicity	378	1	4	1.61	1.043
Religion	378	1	3	1.32	.606
N (listwise)	378				

Table 1 provides the descriptive statistics for the variables gender, age, ethnicity, and religion among the 378 participants. The gender variable, coded as 1 for male and 2 for female, has a mean of 1.61 (SD = 0.488), indicating a higher proportion of females. The age variable, coded from 1 (16-20 years) to 4 (31-35 years), has a mean of 2.20 (SD = 1.005), suggesting that the average age falls between 21-25 years. Ethnicity, coded from 1 (Yoruba) to 4 (Others), has a mean of 1.61 (SD = 1.043), reflecting the predominance of Yoruba participants. The religion variable, coded from 1 (Christianity) to 3 (Traditional), has a mean of 1.32 (SD = 0.606), indicating that most participants identify as Christian.

Hypotheses Testing

Hypothesis 1: *Individuals who score high on Openness to Experience will show a stronger preference for abstract and surrealist art compared to individuals low in Openness to Experience*

The hypothesis was tested using Pearson Correlation the result shows that;

Table 2: *Pearson* Correlations Table of Openness, Abstract Art and Surrealism

Variables	Openness	Abstract Art	Surrealism	p
Openness	1	-	-	-
Abstract_Art	.053	1	-	.305
Surrealism	-.017	-	1	.736

Pearson correlation coefficients were computed to assess the relationships between Openness to Experience and preferences for abstract and surrealist art. The analysis revealed a weak positive correlation between Openness and preference for abstract art, r = .053, p = .305. This correlation was not statistically significant. For surrealist art, the analysis showed a very weak negative correlation with Openness, r = -.017, p = .736. This correlation was also not statistically significant. These results do not support the hypothesis that individuals high in Openness to Experience will show a stronger preference for abstract and surrealist art compared to individuals low in Openness to Experience.

Hypothesis 2: *There will be significant ethnic differences in art preferences, such that individuals from Yoruba and Igbo will prefer pop art, while individuals from Hausa will prefer surrealism art.*

The hypothesis was tested using One-Way ANOVA and the result showed that;

Table 3: *One-Way ANOVA*

Table3.1: Descriptive Statistics showing the Participant's distributio

Surrealism	N	Mean	Std. Deviation
Yoruba	269	3.01	1.430
Igbo	25	2.72	1.339
Hausa	46	3.00	1.333
Others	38	3.24	1.283
Pop_Art	N	Mean	Std. Deviation
Yoruba	269	3.05	1.434
Igbo	25	3.24	1.393
Hausa	46	2.76	1.353
Others	38	2.50	1.351

Table 3.2: ANOVA Results for Surrealism

Surrealism	SS	df	MS	F	p
Between Groups	4.056	3	1.352	.691	.558
Within Groups	731.849	374	1.957		
Total	735.905	377			
Pop_Art	SS	df	MS	F	p
Between Groups	14.035	3	4.678	2.340	.073
Within Groups	747.701	374	1.999		
Total	761.735	377			

A one-way between-subjects ANOVA was conducted to examine the effect of ethnicity on preferences for surrealism and pop art among Yoruba, Igbo, Hausa, and other ethnic groups. For surrealism art, the analysis revealed no statistically significant differences between ethnic groups, f (3, 374) = 0.691, p = .558. Descriptive statistics showed similar mean preferences across groups: Yoruba (M = 3.01, SD = 1.430), Igbo (M = 2.72, SD = 1.339), Hausa (M = 3.00, SD = 1.333), and Others (M = 3.24, SD = 1.283). For pop art, the ANOVA results approached but did not reach statistical significance, f (3, 374) = 2.340, p = .073. Descriptive statistics revealed some variations in mean preferences: Yoruba (M = 3.05, SD = 1.434), Igbo (M = 3.24, SD = 1.393), Hausa (M = 2.76, SD = 1.353), and Others (M = 2.50, SD = 1.351). These results do not support the hypothesis of significant ethnic differences in art preferences.

Hypothesis 3: *High levels of Neuroticism will be associated with a preference for art styles that elicit strong emotional responses, such as surrealism and abstract artworks.*

The hypothesis was tested using Pearson Correlation the result shows that;

Table 4: Correlation Table between Neurotism and Surrealism

Variables	Neuroticism	Surrealism	Abstract_Art	p
Neuroticism	1	-	-	-
Surrealism	-.043	1	-	.409
Abstract_Art	-.082	-	1	.111

Pearson correlation coefficients were computed to assess the relationships between Neuroticism and preferences for surrealist and abstract art styles. The analysis revealed a weak negative correlation between Neuroticism and preference for surrealist art, r = -.043, p = .409. This correlation was not statistically significant. Similarly, a weak negative correlation was found between Neuroticism and preference for abstract art, r = -.082, p = .111. This correlation was also not statistically significant. These results do not support the hypothesis that high levels of Neuroticism will be associated with a preference for art styles that elicit strong emotional responses, such as surrealism and abstract artworks.

Discussion of Findings

1. There was no significant correlation between Openness to Experience and preferences for abstract or surrealist art.

2. Agreeableness did not show a significant correlation with preferences for cubism or digital art.

3. High levels of Neuroticism were not significantly associated with preferences for surrealist or abstract art styles.

4. No significant ethnic differences were found in art preferences among Yoruba, Igbo, Hausa, and other ethnic groups for surrealism and pop art.

The current study's findings present a nuanced picture of the relationship between personality traits and art preferences, often diverging from previous research in this field. Let's examine these findings from past studies:

Openness to Experience and Art Preferences:

My study found no significant correlation between Openness to Experience and preferences for abstract ($r = .053$, $p = .305$) or surrealist art ($r = -.017$, $p = .736$). This contrasts sharply with several previous studies.

Furnham and Walker (2001) found that openness was positively correlated with a preference for abstract, pop art, and representational paintings. Chamorro-Premuzic et al. (2010) consistently found that openness to experience was associated with a preference for more abstract and unconventional art styles like digital art.

One possible comprehensive reason for the discrepancy between the study's findings and those of Furnham and Walker (2001) and Chamorro-Premuzic et al. (2010) could be differences in sample characteristics. Variations in demographic variables such as age, education, cultural background, and prior exposure to art could influence the relationship between openness to experience and art preferences.

Ethnic Differences in Art Preferences:

The analysis of Hypothesis 2, which proposed significant ethnic differences in art preferences among Yoruba, Igbo, Hausa, and other ethnic groups, yielded non-significant results. Here's a detailed discussion of these findings:

1. Surrealism Art Preferences

The descriptive statistics showed that the mean preference for surrealism art was quite similar across the ethnic groups: Yoruba, Igbo, Hausa, and Others. This similarity is confirmed by the ANOVA results ($F(3, 374) = 0.691$, $p = 0.558$), indicating that the differences in preferences for surrealism art among these ethnic groups are not statistically significant.

2. Pop Art Preferences

For pop art preferences, the mean scores were also close: Yoruba, Igbo, Hausa, and Others. Although there was a slight variation, the ANOVA results ($F(3, 374) = 2.340$, $p = 0.073$) showed that these differences are not statistically significant at the conventional $p < 0.05$ level. However, the p-value is relatively close to 0.05, suggesting a trend that might warrant further investigation with a larger sample size.

Neuroticism and Art Preferences:

My study found weak negative correlations between Neuroticism and preferences for surrealist and abstract, which were not statistically significant. This contrasts with some previous findings:

Furnham & Walker (2000) associated Neuroticism with a preference for abstract paintings. The discrepancy suggests that the relationship between Neuroticism and art preferences may be more complex or context-dependent than previously assumed.

Methodological differences such as the measurement tools used to assess openness to experience and art preferences, as well as the specific types of abstract and surrealist art included in the studies, could also contribute to the observed discrepancies.

Conclusion

Contrary to expectations, the study findings suggest that the connections between personality and art preferences are not as straightforward as earlier postulated some theories propose, at least in this specific cultural context. The lack of significant correlations between personality traits and art preferences highlights the need for a more nuanced understanding of how individuals engage with and appreciate different art styles.

The implications of these findings are significant for several fields:

Art Education: Educators should consider a broader range of factors beyond personality when designing art curricula and experiences for students.

Cultural Studies: The lack of significant ethnic differences in art preferences suggests a need for a more in-depth exploration of how cultural factors interact with individual tastes in art.

Psychological Research: These results call for a reevaluation of theories linking personality traits to aesthetic preferences, particularly in non-Western contexts.

Art Therapy: Practitioners should be cautious about making assumptions about clients' art preferences based solely on personality assessments.

Recommendations

Based on the findings, the following recommendations are proposed:

1. Future research should explore a wider range of factors that might influence art preferences, including art education, exposure to different cultures, and personal experiences.

2. Studies should be conducted in diverse cultural settings to better understand how the relationship between personality and art preferences may vary across different contexts.

3. More nuanced measures of art preferences and personality traits could be developed to capture the complexity of these relationships.

4. Longitudinal studies could help track how art preferences evolve over time and about changes in personality and life experiences.

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THE INFLUENCE OF CONSTRAINTS OF SPORTS BUSINESS OPERATIONS ON SPORTS DEVELOPMENT IN NIGERIA

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ABSTRACT

The Sport industry in Nigeria presents a dynamic landscape with both promising opportunities and significant challenges. Understanding these dynamics is crucial for stakeholders aiming to capitalize on the sector's potential. The Sport business in Nigeria faces multifaceted constraints that hinder its growth and development. These constraints include inadequate infrastructure, limited funding and investment, bureaucratic inefficiencies, and regulatory ambiguities. The qualitative research method was used for this study. It was deemed appropriate because the information used can only be obtained from information rich individuals who had the experience and who are top level sport business professionals. The purposive sampling techniques was used to select ten (10) top sport business professionals who served as respondents for this study. The method of data collection was the interview which was analysed using thematic analysis, that's identification of themes from the transcription of the interview.

Kevwords: **Constraints, Sports Development, Prospects, Sport Business, Sport Management.**

Introduction

The Sport industry has had a growing impact on the global economy over the last 20 years with investment in public infrastructure, mobilizing resources and creating new professions and jobs. Today, it is one of the professional sectors with the most economic momentum, creating opportunities for many people who aspire to a future in the world of Sport. sport Management is a field of education concerning the business aspects of Sport (Johan , 2016). At major Sporting events, the competition begins at the same time the bidding process is opened. The Olympics are the biggest multidisciplinary competition worldwide. Through sport, the staging of the Games puts the host country on the world map, revives its economy, boosts tourism, modernizes and, in the best of cases, increases its infrastructure and, most importantly, completely transforms a city that will live the legacy of those games once the competition is over (Johan, 2016).

The legacy both in terms of infrastructure and of the management experience is one of the best introductions when bidding

for future sporting events. The Olympics have helped create an organizational model that, on a smaller scale, is replicated in other disciplines which, with the holding of major international events, manage to attract the interest of the public and a greater appreciation and dissemination of their sport (Johan ,2016). But what determines whether a major sporting event enables everyone involved to win and have a great impact? It depends, above all, on good planning. sport that do not enjoy a massive following in their regular competition calendar can be great shows at specific moments if their organization is professional and attractive to sponsors and the media sponsors fight to be on the list, artists chosen to cover the breaks see this sport as their best promotional platform, and advertisers pay millions to fill those minutes of advertising in a sport that, the rest of the year, attracts almost exclusively the interest of the public (Johan, 2016). Nigeria boasts a thriving Sporting culture, with a passionate population particularly engaged in football (soccer). This passion, coupled with the country's youthful demographics, presents a significant opportunity for the development of a robust sport business sector (Giwa, 2020). However, despite this potential, the Nigerian sport industry faces numerous challenges that hinder its growth (OAPUB, 2023).

Research Questions

The following research questions were answered in this study:

1. What are the key constraints, including infrastructure deficits, funding constraints, and inconsistent policies, faced by professionals in the sport business industry in Nigeria?
2. What are the existing opportunities in the sports business sector in Nigeria, focusing on market growth, technological advancements, emerging consumer trends, and the potential for international partnerships and sponsorships?
3. What are the prospects of the sport business industry in Nigeria, investigating anticipated economic impacts, growth potentials in digital and broadcast media, and opportunities for sport tourism and infrastructure development?

Methodology

This study adopted a qualitative research methodology, which was considered most suitable given the nature of the inquiry. The data required could only be sourced from individuals with deep, experience-based insight, specifically, high-level professionals actively engaged in the sport business sector. Their firsthand knowledge and expertise made them valuable informants for understanding the nuanced dynamics of the field. The population for the study is composed of top-level sport business professionals with sports organisations in Nigeria The purposive sampling techniques was used to select ten (10) information rich sport business professionals who served as participants for the study. A semi-structured interview with stakeholders in the Sport business sector, made up of Sport entrepreneurs, were used for this study. The face validity was established by the project supervisor and the researcher. The research method used was a qualitative approach (interview) for data collection. A total of ten (10) Sport professionals were interviewed, and responses were recorded. Collected data through the interview were analysed using using thematic Analysis

Result

Research questions 1 to 3 are answered using Thematic Analysis. The thematic analysis of the interview data reveals that there are several existing opportunities in the sports business sector in Nigeria. These opportunities are predominantly driven by technological advancements, market growth potential, the role of social media in enhancing visibility and engagement, opportunities for professional and educational development, and talent scouting. Technology, in particular,

plays a crucial role in promoting sports innovation and improving player performance analysis.

The presence of a large market audience and a pool of talented players provides a strong foundation for the growth of the sports business sector in Nigeria. The findings indicate that leveraging these opportunities can lead to significant advancements and prospects for sports professionals in Nigeria. What are the prospects of the sports business industry in Nigeria, considering anticipated economic impacts, growth potentials in digital and broadcast media, and opportunities for sports tourism and infrastructure development.

Thematic analysis was used to systematically analyze the qualitative data gathered. It involves identifying, analyzing, and reporting patterns or themes within the data. For this analysis, the responses were reviewed, and key themes were coded based on recurring patterns and sentiments. The primary themes identified are: (1) Technology Influence, (2) Branding and Sponsorship, (3) Grassroots Development and Talent Discovery, (4) Partnerships, and (5) Parental Influence and Educational Pathways.

Discussion of Findings

To critically discuss this findings on the constraints of business operations and sports development in Nigeria, there is a need to contextualize them within existing literature and theory in sports management, economics, and sociology.

Constraints of the Sports Business in Nigeria

The findings reveal significant constraints facing sports business in Nigeria, including infrastructure deficits, financial constraints, policy and governance inefficiencies, ethical issues, and concerns about professionalization. These findings are consistent with existing literature on sports development in emerging economies, which often points to the lack of adequate infrastructure and resources as a critical barrier to growth (Adeyemi & Aderibigbe, 2020). In Nigeria, the poor state of sports infrastructure limits the ability to host events, train athletes, and foster youth participation (Ogunwale, 2018). Financial constraints are also a common theme in the literature, especially in contexts where sports funding is primarily dependent on government allocations rather than diversified sources like private investments, sponsorships, and community funding (Babiak & Wolfe, 2009). Policy and governance inefficiencies further exacerbate these challenges, as evidenced by fragmented governance structures and a lack of strategic planning in Nigeria (Chappelet, 2017). Addressing these challenges requires an integrated approach, combining government reforms, stakeholder engagement, and investment in infrastructure, aligned with the literature that advocates for holistic policy reforms to drive sustainable sports development (Henry & Lee, 2004). Ethical issues and concerns about professionalization also emerge as barriers to the growth of the sports business in Nigeria. Ethical lapses such as corruption, match-fixing, and lack of transparency in governance undermine the integrity of the sports sector (Gorse & Chadwick, 2011). Furthermore, the absence of structured pathways for professional development has implications for the talent pipeline and the quality of sports administration (Jones et al., 2021).

Opportunities in the Sports Business in Nigeria

The study identifies several opportunities driven by technological advancements, market growth potential, the role of social media, professional and educational development, and talent scouting. The role of technology, particularly in promoting sports innovation and improving player performance analysis, aligns with contemporary trends in global sports (Ratten, 2020). The use of data analytics, performance-tracking software, and digital platforms has revolutionized sports management, creating new revenue streams and enhancing decision-making (Höfer et al., 2015).

Moreover, social media platforms have become critical tools for engaging with fans, building brand loyalty, and expanding the reach of sports entities (Gaines & Barry, 2021). The Nigerian sports market, characterized by a young and dynamic population, offers significant growth potential, as evidenced by rising participation rates and interest in various sports (Ogunniyi, 2015). This presents unique opportunities for brands to tap into new demographics and promote sports as a viable career option. The findings also suggest opportunities for professional and educational development, which are essential for building a robust sports ecosystem. Investing in education and professional training will address the skill gaps currently plaguing the sector and foster a new generation of sports administrators, coaches, and athletes (Smith & Westerbeek, 2007). Talent scouting, particularly in grassroots sports, offers a pathway for discovering and nurturing future stars (Williams, 2018).

Prospects for the Sports Business Industry in Nigeria

The study's findings regarding the promising prospects for the sports business industry in Nigeria, including technology adoption, enhanced branding and sponsorship, grassroots development, strategic partnerships, and changing parental attitudes, reflect global trends in sports development. Technology adoption and digital transformation are increasingly seen as the future of sports management and performance optimization (Shilbury et al., 2020). Enhanced branding and sponsorship efforts could catalyze economic growth, as demonstrated in more mature sports markets (Cornwell & Kwon, 2020). Grassroots development, supported by strategic partnerships between public and private entities, has the potential to create a sustainable sports ecosystem that drives both economic growth and social development (Hoye et al., 2015). In this regard, changing parental attitudes toward sports as a career path is crucial, as societal support can significantly influence the talent pipeline and overall industry vibrancy (Kay & Spaaij, 2011). The study provides a comprehensive overview of the constraints, Opportunities, Prospect of business Operations and Sports Development in Nigeria. The thematic analysis aligns with existing literature, suggesting that while significant barriers exist, there are numerous opportunities and promising prospects for growth. The insights derived from this study have significant implications for policy-making, strategic planning, and stakeholder engagement in the sports sector. Future research could explore specific intervention strategies that leverage these opportunities to address challenges and drive sustainable growth in the sports business in Nigeria.

Conclusion

The study provided a comprehensive overview of the constraints, Opportunities, Prospect of business Operations and Sports Development in Nigeria. The thematic analysis aligns with existing literature, suggesting that while significant barriers exist, there are numerous opportunities and promising prospects for growth. The insights derived from this study have significant implications for policy-making, strategic planning, and stakeholder engagement in the sports sector. Future research could explore specific intervention strategies that leverage these opportunities to address challenges and drive sustainable growth in the sports business in Nigeria.

Recommendations

The thematic analysis of the interview data reveals that there are several existing opportunities in the sports business sector in Nigeria. These opportunities are predominantly driven by technological advancements, market growth potential, the role of social media in enhancing visibility and engagement, opportunities for professional and educational development and talent scouting. Technology, in particular, plays a crucial role in promoting sports innovation and

improving player performance analysis. The presence of a large market audience and a pool of talented players provides a strong foundation for the growth of the sports business sector in Nigeria. The findings indicate that leveraging these opportunities can lead to significant advancements and prospects for sports business operations professional development in Nigeria

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EFFECTS OF PROGRESSIVE RELAXATION ON TRAIT ANXIETY REGULATION AMONG AMATEUR FOOTBALLERS IN LAGOS STATE, NIGERIA

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ABSTRACT

Nigeria has a proud history of success in age-grade football competitions globally. However, in recent years, Nigeria's performance in age-grade football competitions has declined significantly this study examined the effects of progressive relaxation therapy on trait anxiety regulation among amateur footballers, Pre-test-post-test quasi-experimental control group research design was used for the study. The population comprised all juvenile football players in Nakamura football academies. A purposive sample technique was used to select thirty-nine (39) players the participants were assigned to two groups of treatment and control groups. The instrument used to obtain relevant data was the State-Trait Anxiety Inventory (STAI). One research hypothesis guided the study, and the data collected was analyzed using descriptive statistics and the hypothesis tested using Analysis of Covariance (ANCOVA) at 0.05 level of significance. The hypothesis tested was significant. The study revealed that Progressive Relaxation significantly regulates anxiety among juvenile footballers. Additionally, there was a significant positive effect of the therapy on trait anxiety regulation among the participants. The study concluded that anxiety can have deliberating effects on performance, that can prevent footballers from focusing on their performance levels, progressive relaxation, as established in this study, help in regulating anxiety. The study recommends that all footballers be exposed to progressive relaxation therapy, particularly during the developmental stages, to prevent distractions.

Kevwords: Anxiety Regulation, Cognitive therapy, Footballers, Juvenile Footballers, Mindfulness.

Introduction

Participation in competitive sports naturally brings with it a feeling of excitement he or she wins or enjoys the activities, in the same he may experience nervousness or depression and nervousness, as athletes taking part in any sporting activities may tense up at critical points or experience heightened situation before the competition. Football is an emotional sport both on and off the field. Emotion can have a significant impact on football performance, both positively and negatively. Emotions can provide motivation, provide energy and intensity, help to focus and decision making, and can lead to a sense of enjoyment and satisfaction however, strong emotions can also lead to distraction, impulsivity, and poor decision

making. Anxiety can also play a role in football performance. Pre-game nerves are common among football players, but high levels of anxiety can lead to physical and emotional fatigue decreased coordination and reaction time, and impaired decision making. human cannot do without one level of anxiety either state or trait anxiety.

Anxiety, a formidable adversary, infiltrates the minds and bodies of footballers, casting a shadow on their performance. Mentally, it becomes a disruptive force, clouding focus and inducing self-doubt. Physically, the impact is palpable. Tense muscles and racing hearts replace the fluidity required for peak athletics prowess. In this psychological battleground, footballers grapple not only with opponents on the field but also with their own internal struggles. Anxiety is an unpleasant emotional state or reaction that is characterized by feelings of apprehension, intensity, preoccupation, and disturbance and is often associated with biological changes in the body (Nolen- Hoeksema, 2012). Anxiety is divided into two components: somatic and cognitive (psychological) anxieties (Adeyeye, 2013). Anxiety in sport competition could be liken to submission by these athletes, in 2015, Sidney Crosby, a two-time Olympic gold medalist, and a world champion, opined that any athlete that did not feel nervous was not human. In 2018, Kevin Love, the American Basketball player said he had an incident at halftime against the Atlanta Hawks during an early season game and that he felt trapped without knowing what was wrong. Tennis player Naomi Osaka noted that one could easily get depressed as a result of poor performance. Michael Phelps, one of the best Olympic swimmers, was affected by anxiety. Anxiety can have profound effects on both mental and physical health. It might may lead to persistent worry, irritability, and difficulty concentrating, hindering daily activities.

Purpose of the study

The purpose of the study is to determine the effects of Progressive Relaxation on trait anxiety of juvenile footballers

Research Questions

1. What effects does Progressive Relaxation have on the trait anxiety of Juvenile Footballers?

Research Hypothesis

1. Progressive Relaxation will not have any significant effects on the trait anxiety of Juvenile Footballers

Methodology

The research design for this study was a quasi-experimental, pre-test, post-test control group design. Purposive sampling was used to select thirty-nine football players in the Nakamora football club, Mushin for the study and were duty divided into two groups which are one experimental group and one control group, the treatment group were given progressive relaxation therapy for eight weeks and while the control group were not given placebo during the study. Basically, to thoroughly the effect of progressive relaxation therapy on the treatment group.

Administration of Research Instruments

The administration of research instruments was in three phases, and these instruments were given to the participants by the researcher and the research assistants. The phases are as follows:

Phase 1: Pre-treatment Session
Phase 2: Treatment Session
Phase 3: Post-treatment Session
Phase 1: Pre-treatment Assessment

The researcher, administered State-trait Anxiety Inventory and analyzed. to the participants for easy identification of footballers with high anxiety.

Phase 2: Treatment Phase

There were one treatment group and one control group. The selected footballers were randomly assigned to treatment and control group. Treatment group was exposed to Progressive Relaxation, group two the control group was given placebo. The treatment Groups met once a week for eight weeks.

Phase 3: Post-test Assessment

At the end of the treatment which lasted for eight weeks, State-trait Anxiety Inventory was re-administered to the treatment and control group.

Treatment Procedure:

Phase 2: Treatment Phase

There were one treatment group and one control group. The selected footballers were based on their anxiety level, and assigned to treatment and control groups. Group one was exposed to Progressive Relaxation; Group Two was exposed to placebo.

Phase 3: Post-test Assessment

At the end of the treatment which lasted for eight weeks, State-trait Anxiety Inventory was re-administered to the treatment and control group.

Results

Hypothesis

Progressive relaxation will have no significant effect on the Trait Anxiety of Juvenile Footballers in Lagos State.

Table 1: ANCOVA showing the effect of Progressive relaxation on trait anxiety of juvenile footballers

Source	Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared(η^2)
Progressive relaxation	493.800	1	493.800	10.455	.002	.203
Trait anxiety (pre-test)	2820.206	1	2820.206	59.709	.000	.593
Error	1936.520	41	47.232			
Total	5004.795	43				

$P < 0.05$; $F(1, 41) = 4.08$. Key: $\eta^2 = 0.01$ (small effect); $\eta^2 = 0.06$ (medium effect); $\eta^2 = 0.14$ (large effect)

Table 1 shows the effect of progressive relaxation on trait anxiety of juvenile footballers. From the results, there is a significant effect of progressive relaxation on trait anxiety of juvenile footballers, because the calculated F-value of 10.455 is greater than the critical value F (1, 41) = 4.08 at 0.05 level of significance. Similarly, the effect size (η^2) = 0.203 shows a large effect of progressive muscle relaxation on trait anxiety. Hence, progressive relaxation has a significant effect on trait anxiety of juvenile footballers in Lagos State. Based on the significant F-value obtained, a Post-Hoc analysis was

done using Bonferroni method to determine which of the groups differs from the other in trait anxiety, and the trend of the difference

Table 2: Post-Hoc analysis showing pair-wise comparison between the groups

(I) Group	(J) Group	Mean Difference (I-J)	Sig.[b]
Progressive relaxation	Control group	-7.122*	.002
Control group	Progressive relaxation	7.122*	.002

From Table 2, the pair-wise comparison of the group showed that progressive relaxation group differed from control group in trait anxiety ($P = 0.002 < 0.05$).

Discussion of Findings

The study hypothesis stated that progressive relaxation will have no significant effect on regulation of trait anxiety among amateur footballers. The result of the analysis indicated that progressive relaxation therapy had significant impact on trait anxiety of amateur footballers. The hypothesis is therefore rejected. The finding established the effective of progressive relaxation therapy on regulation of trait anxiety amateur footballers. In a related study Bernstein and Borkovec (1973) found that progressive relaxation was effective in reducing trait anxiety and recommended it as a useful therapy for treating anxiety disorder. However, well, A. (1990) argued that progressive produces short-term reduction in anxiety and does not address the underlying cognitive factors that contribute to trait anxiety. Progressive relaxation helps reduce anxiety systematically relaxing muscles group, promoting physical calmness and mental clarity. This technique lowers anxiety and stress levels, improves overall well-being, and enhances emotional resilience.

Conclusion

The use of progressive relaxation as established in this study will help to reduce this growing psychological factor that affects performance.

Recommendations

Based on the findings of this study, the following recommendations were made:

1. All players should be exposed to progressive relaxation therapy particularly during developmental stages in order to be able to regulate their min.
2. The services of a sports psychologist should be embraced by administrators of academies so as to facilitate better understanding and application of various psychological skills by the players and coaches.

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STUDENTS' ATTITUDE TOWARDS THE USE OF AI-BASED PERSONALIZED LEARNING TO ENHANCE ENGAGEMENT IN INTRODUCTION TO COMPUTING SCIENCE

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ABSTRACT

This study investigates students' attitudes toward AI-powered personalized learning as a strategy to enhance engagement in Introduction to Computing Sciences*. The study addresses the problem of declining student engagement due to large class sizes and overburdened lecturers in Nigerian universities. Two research questions were formulated, along with one hypothesis to examine gender differences in students' attitudes toward AI-powered learning. A descriptive survey research design was adopted, with a population of 850 students from the Department of Science Education, Federal University Otuoke. A purposive sampling technique selected 85 students for the study. The instrument for data collection was the Students' AI-Powered Personalized Learning Attitude Questionnaire (SAPPLAQ)***,*** *validated through pilot testing and expert reviews, achieving a reliability coefficient of 0.78. Findings indicate that students generally have a positive attitude toward AI-powered personalized learning, believing it enhances engagement. However, female students demonstrated a more positive attitude toward AI-driven learning than their male counterparts. A z-test analysis revealed a significant difference in gender-based attitudes. The study recommends integrating AI-powered learning tools in introduction to computing science, tailoring AI-driven content to diverse learning preferences, and conducting further research on factors influencing gender differences in AI adoption.*

Kevwords: **AI-Powered Learning, Student Engagement, Personalised Learning, Computing Science, Gender Differences.**

Introduction

In the first semester examination timetable for the academic year 2024/2025 at the Federal University Otuoke, it has been meticulously noted that a total of 27 departments across various faculties were scheduled to undertake COS 101: Introduction to Computing Sciences. Also, an extensive examination of the Core Curriculum Minimum Academic Standards (CCMAS) has as well revealed that COS 101, Introduction to Computing Sciences, is categorized as a National University Commission course; consequently, it is anticipated that all Nigerian students, irrespective of their respective course affiliations, are mandated to participate in this course. Therefore, it is evident from various indicators that the significance of this course is profoundly substantial (Okebukola & Saliu, 2023). At this juncture, it is crucial to closely examine the objectives and content of the course as delineated within the CCMAS.

To begin with, it is important to emphasize that this course is mandatory for all Nigerian students. COS 101 carries a total of 3 credit units, comprising 30 hours of lectures and 45 hours of practical sessions. The expected learning outcomes include, but are not limited to: exploring the historical development of computing up to modern advancements in the field; identifying key features of various computing programs; understanding the roles and applications of computers across multiple sectors; recognizing the basic components of a computer system; acquiring foundational skills in computer usage; becoming proficient in standard office productivity tools; and effectively using the Internet for information gathering, learning, and continuous professional growth. The course content also covers the history of computing sciences, the evolution and characteristics of the different computing disciplines, as well as hardware, software, and their integration and application across business and other areas of society. Moreover, the CCMAS document specifies that students are required to complete laboratory-based tasks using the PC's operating system and widely adopted applications such as word processors, spreadsheets, presentation tools, graphic software, and other relevant programs (Okebukola & Saliu, 2023).

In essence, this requirement underscores the fact that student involvement and engagement constitute a critical component of the course, as the successful completion of these assignments necessitates active participation, hands-on practice, and the development of practical skills in using these essential digital tools. Should the engagement of students be deemed significant, it is essential to establish mechanisms that facilitate student involvement. Based on available research, one of the principal and substantiated methods to foster student engagement is through motivation. This is predicated on the notion that a highly motivated student is more inclined to exhibit elevated levels of engagement in their learning endeavors (Avanti Team, 2023). Student motivation pertains to the intrinsic drive or willingness of an individual to pursue knowledge and assume an active role in their educational journey, whereas "student engagement" denotes the observable behaviors that signify their participation and interest in a learning activity.

Engagement signifies a student's active involvement in learning, while motivation drives this engagement (Waterman & Schwartz, 2024). AI-enhanced personalized learning environments customize educational content to fit students' cognitive capacities, delivering immediate feedback, tailored learning paths, and gamified elements that enhance motivation (Roll & Wylie, 2016). The deployment of AI-based adaptive learning systems allows students to interact with appropriately challenging material, reducing frustration and promoting achievement (Heffernan & Heffernan, 2014). Consequently, AI educational tools, including intelligent tutoring systems (ITS) and machine learning algorithms, are pivotal in assessing student learning behaviors and crafting personalized study regimens that address individual needs and learning styles (Kulik & Fletcher, 2016). By persistently tracking students' progress, these tools modify instructional content instantaneously, ensuring learners encounter suitable challenges and support for optimal academic growth. These AI methodologies foster a more engaging, student-centric educational atmosphere by nurturing autonomy, competence, and relatedness—essential elements of the Self-Determination Theory (SDT) of motivation (Deci & Ryan, 1985). Autonomy is facilitated as students exercise control over their learning trajectories, progressing at their own speed. It is widely believed that introducing AI-driven platforms, capable of providing personalized feedback in university courses like Introduction to Computer Science can enhances competence and boosts students' confidence in their skills. (Sajja etal 2024).)

AI-driven platforms like Coursera, Khan Academy, and OpenAI enhance learning experiences in courses such as Introduction to Computing Science by offering personalization, automation, and intelligent tutoring, thereby fostering

greater student engagement. Coursera personalises course recommendations and improves learning efficacy via automated grading and virtual labs (Ng & Koller, 2012). Khan Academy employs AI for personalized learning paths, adaptive exercises, and real-time feedback, promoting student retention and engagement (Khan, 2016). OpenAI's applications, such as ChatGPT, facilitate interactive tutoring and problem-solving through natural language inquiries (OpenAI, 2023). These platforms significantly enhance accessibility, engagement, and effectiveness in education, emphasizing AI's transformative role in academia. Students can engage interactively with computing topics, receive tailored coding challenges, and maintain an appropriate difficulty-skill ratio. Gamification strategies, including leader boards and badges, enrich the learning experience, while real-time feedback aids in skill refinement and concept retention, alleviating lecturer workload and ensuring uniform educational quality for all Nigerian students (Luxton-Reilly et al., 2018).

It is crucial to assert that initiatives aimed at reducing lecturers' workload are fundamentally beneficial. Given the evident overload faced by Nigerian university lecturers, advocating for AI-driven engagement is justified. Integrating AI tools in teaching computing fundamentals in Nigerian universities will enhance lecturer efficacy, student participation, and educational outcomes. AI reduces instructors' workloads by automating repetitive tasks, enabling them to concentrate on mentorship and complex problem-solving. Furthermore, AI tools can enhance access to expert knowledge by incorporating virtual educators and industry professionals. Due to the shortage of qualified computing instructors in several Nigerian universities, AI-enhanced platforms like Coursera and ChatGPT will provide high-quality resources and expert insights; ensuring students receive a competitive education. AI tools will enhance educational consistency in Nigerian universities. Traditional methods can create disparities due to instructor variability. AI standardizes education by providing organized and uniform content, ensuring equitable educational outcomes for all students. The integration of AI can transform computing science in Nigerian universities, making it more accessible and aligned with global standards. This transformation is indeed significant for computing science accessibility and standardization. However, student attitude is considered a crucial factor in this process.

Students' attitudes towards AI learning will significantly influence the effectiveness of AI-driven educational innovations. While some may view AI as beneficial for personalized learning, others might find it impersonal or challenging. Understanding these attitudes is vital for successful AI tool implementation. Therefore, it is essential to investigate student perceptions of AI learning as a means to enhance engagement. Exploring student attitudes towards adaptive learning, feedback, and gamification can reveal insights into their motivations and challenges (Anih 2024). Identifying factors influencing receptiveness, such as prior AI experience and gender differences can help refine AI platforms to better meet student needs.

Gender differences have a notable impact on students' views of AI-driven personalized learning. Research suggests male and female students exhibit varying levels of confidence and interest in computing, influencing their engagement with AI. Males may prefer competitive environments, while females often lean towards collaborative problem-solving. These distinctions highlight the need for AI educational tools to cater to diverse learning preferences. Understanding students' attitudes toward AI learning is crucial for improving engagement. Insights into student interactions with AI can inform educators and developers in fostering motivation and inclusivity.

The researcher is assessing student attitudes toward AI learning to evaluate its effectiveness in enhancing engagement in computing sciences. This understanding is essential in the evolving educational landscape. The effectiveness of AI learning tools increasingly depends on student perceptions and interactions with these technologies. While personalised learning can enhance engagement, its success is contingent upon student acceptance of AI and adaptability to technology-driven education. Without understanding these attitudes, AI education implementation may encounter obstacles, potentially leading to disengagement and learning disparities. However, a thorough examination of student attitudes will provide valuable insights for educators, policymakers, and EdTech developers to foster effective and inclusive AI learning environments. Thus, the essence of this research is titled; students' attitude towards the use of AI-based personalised learning to enhance engagement in introduction to computing science.

Statement of Problem

The surge in student enrollment in Nigerian institutions, particularly in foundational computing science courses, strains lecturers. Overcrowded classrooms overworks lecturers, the consequence of this influx, are, diminish instructional quality and individualized student attention, leading to passive learning (Okonkwo & Eze, 2021). This problem is compounded more by shortage of qualified computing science lecturers relative to the growing student population. According to Nwosu et al. (2020), there is a shortage of experts in computing sciences, leading to inconsistencies in the depth and quality of knowledge being disseminated. Given the crucial role of computing science in this digital era, there is a need for uniformity in the delivery of Introduction to Computing Sciences across institutions, ensuring that students receive instruction from qualified experts in the field. AI-powered personalized learning has been proposed as a potential strategy to alleviate these challenges. By leveraging artificial intelligence to tailor learning experiences based on individual student needs, such systems can enhance student engagement and learning outcomes while reducing the workload on lecturers (Adegbite et al., 2022). However, despite the promising potential of AI in education, there is limited research on students' attitudes toward AI-powered personalized learning in the Nigerian context. Understanding students' perspectives on such technology is crucial for successful implementation and adoption in higher education. Thus, this study seeks to examine students' attitudes toward AI-powered personalized learning as a strategy to boost engagement in introduction to Computing Sciences. The findings will provide insights into the feasibility and effectiveness of AI-driven learning solutions in addressing the challenges faced by students and lecturers in Nigerian universities.

Purpose of the study

The primary aim of this study is to investigate students' attitudes toward AI-powered personalized learning as a strategy to enhance engagement in introduction to computing sciences. Specifically, this study shall seek to

1. Examine impact AI-powered personalized learning have on students' engagement in introduction to computing sciences.
2. Explore the differences in male and female students' attitudes toward AI-powered personalized learning in introduction to computing sciences?

Research Questions

1. What impact does AI-powered personalized learning have on students' engagement in introductory computing sciences?
2. What are the differences in male and female students' attitudes toward AI-powered personalised learning in introductory computing sciences?

Research Hypothesis

There is no significant difference in the male and female students' attitudes toward AI-powered personalised learning.

Methodology

A descriptive survey methodology was utilized for this investigation. This method integrates both quantitative and qualitative data to provide valuable insights. The descriptive survey design is effective, focusing on subjects relevant to the research objective. It facilitates the gathering of comprehensive data suitable for frequency, mean, and pattern analysis (Anih & Chukwu, 2025). The study aimed to evaluate the effect of AI-driven personalized learning on student engagement in foundational computing sciences, thus categorized as non-experimental and exploratory-descriptive. It is predicated on the notion that such investigations intricately elucidate contextual factors. Descriptive research accurately portrays situations (Burns & Grove, 2003). Consequently, it can be utilized to form conclusions following a systematic assessment of prevailing conditions and practices. Thus, as noted by (Hussain, Cakir & Candeğer, 2018), the descriptive research methodology was employed to assess students' perceptions of AI-enhanced personalized learning and its effect on engagement in foundational computing sciences.

The research focused on students from the Departments of Sciences Education at the Federal University Otuoke. Therefore, a survey methodology was chosen for data collection, considered appropriate for sciences education (Blaxter, Hughes, & Tight, 2002; Polit, Hungler & Beck, 2001) in exploratory contexts. The study population comprised university students, with Federal University Otuoke accommodating about 10,000 students across 50 programs (fuotuoke.edu.ng 2025). Employing multistage sampling techniques, first-year and second-year students from the Bachelor in Science Education Programs were selected. The Science Education Department includes 740 students, and a purposive sampling strategy was implemented to choose a sample of 249 students. This choice was warranted, as only these academic levels engage with CCMAS, with the course "Introduction to Computing Science" constituting 70% of the CCMAS curriculum as outlined by NUC.

Furthermore, first-year students are the most recent cohort to have undertaken the course, while second-year students have either completed or are re-taking the course, rendering them suitable for the survey due to their pertinent experiences. This rationale underpins the convenience sampling method adopted in the study (Hussain, Cakir & Candeğer, 2018). Additionally, the researcher engaged with program class representatives after classes to elucidate the research aims, methodologies, and various study facets; the research instruments and data collection strategies were discussed, leading to their consent to partake in the survey. Tool for Data Collection: A quantitative descriptive and exploratory study employed a sample survey method for data acquisition. The researcher developed the Students'-Powered Personalized Learning Attitude Questionnaire (SAPPLAQ). This four-point rating scale was formulated based on the study's objectives and themes discovered in the literature review. These themes are delineated as table headings in the findings section. The instruments were validated through pilot testing with 30 students and expert evaluations. Modifications were made to

finalise the instruments based on pilot feedback and expert suggestions. The reliability coefficient for the questionnaire was 0.78 among university students. A meticulous proofreading of the instrument was conducted prior to data collection.

Procedure of Data Collection and Implementation of Research Tools: Data collection was facilitated by trained class representatives from various programs. Participation in the survey was voluntary. Respondents were fully informed about the study and data collection process by the data collectors. Participant confidentiality was guaranteed. The instrument was administered to 249 Bachelor of Science education students, achieving a 93% response rate from 233 completed questionnaires. Considering Research Ethics: Ethical standards in educational sciences were rigorously followed by the researcher and data collectors. Data Analysis Techniques: After data collection, data collectors entered coded questionnaire responses into MS Excel. The study aimed to evaluate student attitudes toward AI-powered personalised learning and its impact on engagement in computing sciences; therefore, descriptive statistics, specifically mean and standard deviation, were used for analysis. This approach clarifies findings without technical complexity. Scale values ranged from 4 (strongly agreed) to 1 (strongly disagreed) for analysis. The analysed data is subsequently presented in tabular format along with study findings.

Results

Research Question 1:

What impact does AI-powered personalised learning have on students' engagement in the introduction to computing sciences

Table 1: Response on the AI-powered personalised learning impact on the students' engagement in the introduction to computing sciences

Item	Statement	X	SD	Decision Ruled
1	AI-powered personalised learning will help enhance students' interest in the introduction to computing sciences.	2.94	0.92	Agreed
2	AI-powered personalised learning will help to improve students' participation	3.15	0.80	Agreed
3	AI-powered personalised learning will help students better understand complex computing concepts	2.10	0.93	Disagree
4	AI-powered personalised learning will encourage self-paced learning among	2.97	1.14	Agreed
5	AI-powered personalised learning will provide timely feedback that supports student engagement.	2.26	1.03	Disagreed
6	AI-powered personalised learning will motivate students to complete	3.27	0.79	Agreed
7	AI-powered personalised learning will reduce students' frustration with computer science coursework	2.94	0.87	Agreed

Table 1 presents the analysis of AI-powered personalised learning's impact on students' engagement in Introduction to Computing Science. Mean scores ranged from 2.10 to 3.27, with a clustered mean of 2.80 and a standard deviation of 0.93, indicating consistency in responses. The results suggest that students have a positive attitude toward AI-powered personalised learning, believing it can enhance their engagement in the course.

Research question 2

What are the differences in male and female students' attitudes toward AI-powered personalised learning in the introduction to computing sciences?

Table 2 Response on the differences in the in male and female students toward AI-powered personalised learning in the introduction to computing sciences.

Item	Statement	X	SD	Decision
1	The students have different levels of interest in AI-powered personalised learning for computing sciences.	2.18	1.08	Disagreed
2	Male students are more likely to engage with AI-powered personalised learning tools than female students.	2.23	1.10	Disagreed
3	Female students find AI-powered personalised learning more beneficial for understanding computing concepts compared to male students.	2.99	1.47	Agreed
4	Male students demonstrate higher confidence in using AI-powered learning platforms than female students.	2.87	1.08	Agreed
5	Female students prefer traditional teaching methods over AI-powered personalised learning.	2.14	1.35	Disagreed
6	AI-powered personalised learning equally benefits both male and female students in computing sciences.	1.84	0.79	Disagreed
7	Gender plays a significant role in students' attitudes toward AI-powered personalised learning in introductory computing sciences.	3.02	0.79	Agreed

Table 2 presents an analysis of gender-based differences in students' attitudes toward AI-driven personalised learning in introduction to computing science courses. The mean scores range between 1.84 and 3.02, yielding a cluster mean of 2.46 and a standard deviation of 1.09. The close values of the standard deviations suggest consistency in responses across the group. The cluster mean highlights noticeable variations in attitudes between male and female students, with female participants demonstrating a more favourable attitude and greater interest in AI-powered personalised learning compared to their male counterparts.

Hypothesis

Ho_1: There is no significant difference in the male and female students' attitudes toward AI-powered personalised learning.

Table 3: Summary of z-test Analysis of the Mean Ratings of difference in the male and female students' attitudes toward AI-powered personalised learning.

Group	n	$\bar{x}$	SD	df	Level of Sig	Z_{cal}	Z_{crit}	Decision
Male	127	2.39	0.99	231	0.05	3.69	1.96	Rejected
Female	106	2.87	1.03					

The data presented in Table 3 reveal that, with 231 degrees of freedom, the computed Z-value (3.69) surpasses the critical Z-value (1.96) at the 0.05 significance level. This result demonstrates a statistically significant difference between male and female students' attitudes toward AI-powered personalized learning. Consequently, the null hypothesis is rejected, indicating that a notable disparity exists in their mean attitudes. This outcome aligns with the findings in Table 2, which showed that female students exhibited a more positive attitude toward AI-driven personalized learning.

Discussion of Findings

The study examined students' attitudes toward AI-powered personalized learning in introductory computing sciences, revealing critical insights into engagement, gender differences, and statistical significance. The mean result of research question one, suggests that students generally have a positive attitude toward AI-powered personalized learning and

believe it enhances their engagement in introduction to computing sciences. This aligns with previous studies emphasizing that AI-driven personalized learning fosters student motivation and deeper comprehension by adapting to individual learning styles (Zawacki-Richter et al., 2019, Anih 2024,). Personalized AI learning tools, such as adaptive quizzes and

automated feedback systems, improve engagement by offering customized learning experiences that align with students' cognitive needs (Taşkın, 2025). This finding supports the notion that AI integration in computing education can facilitate higher participation and understanding among students.

The research findings of research question two highlighted that female students exhibited a more positive attitude and interest in AI-powered personalized learning than their male counterparts. This contrasts with earlier studies suggesting that male students are generally more receptive to technological advancements in education (Kocaleva et al., 2014). However, recent research has shown that female students tend to appreciate structured, guided, and personalized learning environments, which AI-powered systems often provide (Huang et al., 2020). The study's findings contribute to a growing body of knowledge indicating that gender-specific educational strategies may be necessary to optimize AI integration in learning environments.

The statistical analysis indicates a significant difference in male and female students' attitudes toward AI-powered personalized learning. This suggests that gender plays a role in shaping students' perceptions of AI-enhanced education. Prior research has documented that learning preferences and engagement levels often vary between genders, influencing the adoption of technology-driven educational tools (Silva & Fernandes, 2019). This study reinforces the argument that AI-driven educational technologies must consider gender-responsive approaches to maximize effectiveness in computing science education. In summary it can be stated that the findings will contribute to optimizing adaptive learning strategies, ensuring they align with students' needs, and fostering a more engaging and equitable approach to introduction computing science. Ultimately, this research will play a pivotal role in shaping the future of AI-driven personalized learning, making it a powerful tool for enhancing student success in computing disciplines

This study contributes to the literature by confirming that AI-powered personalised learning enhances student engagement in computing sciences, aligning with prior research. It also challenges existing assumptions about gender and technology use, showing that female students exhibit greater interest in AI-driven learning than males, with statistically significant differences. This highlights the need for gender-sensitive approaches in personalised learning models.

Recommendations

1. Designing AI tools that cater to different engagement styles across genders.
2. Implementing institutional policies and training to support AI use in computing courses.
3. Conducting further research to understand the factors behind gender differences in AI learning adoption.

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ENTREPRENEURIAL SPIRIT OF OFFICE TECHNOLOGY AND MANAGEMENT GRADUATES AND ECONOMIC ENGAGEMENT IN SOUTHWEST NIGERIA

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ABSTRACT

The study examined how the development of entrepreneurial spirit could aid office technology and management graduates' economic engagement in Southwest Nigeria. Three research questions guided the study. A descriptive research design of survey typed was used. A total of 281 business education students at postgraduate level in state-owned universities in southwest Nigeria made up the study's population. It was not necessary to sample since the study's population was not very big. The researchers developed a questionnaire tagged: Entrepreneurial Spirit, Office Technology and Management Graduates' Economic Engagement Questionnaire (ESOTMGEEQ) was used for data collection with reliability coefficient (r = .87). Descriptive statistics of mean, standard deviation and bar-chart were used for answering and presenting research questions 1 and 2. Research question 3 was answered using regression analysis. The findings of the study indicated that OTM graduates have lower levels of entrepreneurial spirit. OTM graduates have lower levels of economic engagement. Entrepreneurial spirit aid office technology and management graduates' economic engagement and that an increase in office technology and management graduates' economic engagement could be attributed towards entrepreneurial spirit. The study recommended that the stakeholders in OTM programme should incorporate the teaching and learning of entrepreneurial spirit into the curriculum of the discipline for effective instruction delivery. Government through its agency like Bank of Industry (BOI) should develop a loan package for the graduates of OTM for venture into entrepreneurial businesses with single interest rate to reduce graduates' unemployment.

Keywords: **Entrepreneurial Spirit, Office Technology and Management, Graduate, Economic Engagement**

Introduction

One of the major problems confronting Nigeria economy today is the issue relating to graduates of tertiary institutions

were not been in economically engaged. This is also among the factors that are increasing unemployment, poverty level and poor standard of living in the country. Graduates economic engagement entailed the level to which they are participating in activities that can drive development in such a way that the unemployment level will drastically reduce to the bearest minimum, dwell in knowledge economy in form of research development leading to innovative business and entrepreneurial enterprises. Graduates' economic engagement is supposed to drive economic and research development, access to talent and new innovations and creativity. However, this economic engagement are the legal activities that the graduates can embark on for self-sustenance, rather than been jobless and constitute problem to the country. Likewise, economic engagement has the capability to create job through the establishment of small and scale businesses and become employer of labour rather than looking for unavailable white-collar job. Being economically engaged can also contribute to new skills development, novel business ideas and expand the scope of economic activities in such a country.

Although, the issue of graduates economic engagement in Nigeria seems to have received attentions from the body of literature (Alatise & Ajani, 2023; Muh, Muhammad & Rijal, 2023; Fudamu, Peter & Kwabe, 2024). These literatures stated that most graduates in Nigeria are not being economically engaged and that their level of economic production might be eroded as a result of unemployment. That is, majority of Nigerian graduates were not with legal work activities and part of the reasons fueling different crimes among the youths like involvement in Yahoo, Yahoo-Yahoo, kidnapping, army robbery, sexual workers and many more. Abiodun and Tijani (2023) stated that Nigeria government had taken steps towards making tertiary institutions graduates more engaged economically through the inclusion of entrepreneurship education into the curriculum of all institutions in the country. They believed that one of the reasons graduates are not economically engaged is that they lack entrepreneurial skills that can boost they spirit towards developing own business if white-collar job is not available. And that these graduates failed to develop inbuilt capability of self-direction that can propel their decision to be made after completion of National Youth Services. However, this ignorance on the part of Nigerian graduates have made many to involved in illegal activities to make a living and those that refused to participate in such remained without job for long period of time where poverty rate continues to increase (Mamman & Ogungboye, 2023).

The introduction of entrepreneurship education into various institutions has different dimensions that tend to develop graduates or students' entrepreneurial mindset, knowledge, engagement, development and spirit. But, in this paper, entrepreneurial spirit is the focus which entails capability of graduates to have positive mindset on venturing in business and become employer of labour. Have skills in entrepreneurial spirit might be a propel factor for graduates to take business risk, action on novel business ideas development and ability to think beyond scope on how to be economically self-sustenance. Entrepreneurial spirit of graduates also means motivation and courage to commence and create business venture needed in an environment with the hope of making economic activities for a living (Adeyemi & Owoeye, 2024). Such businesses are supposed to be tailored towards success and driving by spirit of the owner and in long run it will create employment opportunities for the environment and economic development.

Entrepreneurial spirit is important for graduates to participate in economic development of any nation, most especially developing nation like Nigeria. It enhances the ability to create job, develop local materials and exchange for foreign currency, thereby having capability of reducing social vices found among today graduates (Urbano & Aparicio, 2015). Entrepreneurial spirit helped graduates to develop critical creativity, business thinking, and innovative ideas for new enterprises. Entrepreneurial spirit also helped graduates to have more business resilient, agility in orientation towards

building new products and services and focus towards on goal achievement (Abiodun & Tijani, 2023). Ezechukwu, Okanazu, Babalulu, Arowolo and Olelewe (2021) reiterated that entrepreneurial spirit among the factors that promote career readiness of office technology and management (OTM) for economic gain.

Office technology and management (OTM) is subset of Business Education programme and its vocational education that train its recipients for economic development, ability to be self-sustenance. According to Ezechukwu *et al.,* (2021), OTM is a kind of vocational programme that equipped its graduates to work and function in an office as well as become entrepreneurs if there is no availability of white-collar job. OTM graduates were supposed to have been trained in such way to venture into secretarial business as said by Mamman and Ogungboye (2023) for economic engagement. According to these authors, secretarial business could be used as form of economic engagement for today graduates of OTM in Nigeria where many graduates cannot secure job in the economy. Secretarial businesses such as transcription, resume writing and career consultation, word processing, editing and proofreading, business writing, preparing spreadsheets and presentation materials, book keeping and billing, database and contact management, desktop publishing, graphic design, multimedia presentations, office management and organizing consultation, web site design, internet research, social media marketing, article marketing as well as answering service (Ikuenomore & Oludipe, 2024).

The theoretical framework for this study was Skill Acquisition Theory (SAT). Robert Dekeyser proposed this theory in 2007. According to the idea, knowledge growth occurs in three stages: declarative, procedural, and automatic. Procedural knowledge is implicit information pertaining to behaviour, while declarative knowledge is explicit knowledge about a subject. And automaticity happens when a person has practiced a lot and is at the stage where they are fully proficient at an activity. The order of these phases is important from the standpoint of SAT, as is the proper mix of declarative stage concrete examples and abstract principles. This idea states that skill acquisition is the progressive shift from using cognitive skill consciously and actively to using it more automatically and fluently. According to SAT, there are a few prerequisites that are necessary to raise the possibility of proceduralisation success. First, there must be strong and precise declarative knowledge, either acquired inductively via processes of abstraction and analogy or deductively through specific instructions given to the learner. Second, learners should have many chances to regularly utilize this knowledge representation. When performing the desired behaviour at these occasions, the declarative knowledge must be accessible in an easily assimilated way. Declarative knowledge does not necessarily need to be kept in long-term memory; rather, it must be active in working memory so that it may be quickly converted into procedural information.

The theory is relevant to this research since skill learning is task-oriented and good feedback requires diagnosing a task and dissecting it into its constituent parts. Feedback becomes much less helpful when a task cannot be conceptualised. Since the theory outlines the steps involved in acquiring a skill, it will be beneficial to OTM graduates studying skill-related disciplines. The identification and development of the skill's component pieces, which include creating a mental image of the skill, are necessary for the cognitive phase. The different parts of the talent will then be connected via practice. Additionally, the skill will become instinctive with continued practice for viable economic engagement.

Statement of the Problem

The circumstances surrounding graduates' unemployment in Nigeria is pathetic and of serious concerns to the government and other stakeholders in the society. Graduates of tertiary institutions in all categories supposed to have been trained and equipped with required skills and courage to be economically engaged in a society so that the issue of unemployment among them could be reduced drastically. However, the contemporary situation of graduates in Nigeria is not a welcome

development where after many years of graduation, majority of them still cannot engage in any serious economic activities or findings white-collar job. One may begin to think that insecurity and rising level of crime among the youths could be as a result of high level of graduates' unemployment or none being economically engaged. Even, many frauds perpetuated online in Nigeria today could be trace towards graduates not being engaged. Many of these graduates have found their selves in shameful activities for a living and early death. Although, government and its agencies have so far taken steps towards reducing graduates' unemployment in Nigeria towards introducing Bank of Industry to train and fund youth enterprise development programme. Despite that, many graduates in the country still find it difficult to be economically engaged after years of graduation. It is against this backdrop that prompted this study to examine how the development of entrepreneurial spirit could aid office technology and management graduates' economic engagement in Southwest Nigeria

Purpose of the study

The main objective of the study was to examine how the development of entrepreneurial spirit could aid office technology and management graduates' economic engagement in Southwest Nigeria. Specifically, the study sought to:

1. identify level of entrepreneurial spirit among office technology and management graduates;
2. ascertain the level of economic engagement among office technology and management graduates;
3. find out the extent to which entrepreneurial spirit could aid office technology and management graduates' economic engagement.

Research Questions

The following research questions guided this study:

1. What is the level of entrepreneurial spirit among office technology and management graduates?
2. What is the level of economic engagement among office technology and management graduates?
3. To what extent entrepreneurial spirit could aid office technology and management graduates' economic engagement?

Methodology

A descriptive research design of survey typed was used for this study. The reason for using this design was that it helped the researchers to collect responses from respondents towards answering the research questions. The population of the study comprised graduates of Office Technology and Management (OTM) across Southwest in Nigeria. For ease of clarification, these OTM graduates can be found among those who are currently into their postgraduate programme in Business Education. However, a total of 281 business education students at postgraduate level in state-owned universities in southwest Nigeria made up the study's population. The following are the names of the State Government-owned universities in Southwest Nigeria that provided postgraduate business education:

Table 1: Study Population

S/N	State-owned universities in South-West of Nigeria	States	Population
1.	Lagos State University (LASU)	Lagos	55
2.	TASUED, Ijagun	Ogun	132
3.	OOU	Ogun	50
4.	Ekiti State University (EKU)	Ogun	44
	Total		281

Source: National University Commission, 2025

It was not necessary to sample since the study's population was not very big. The whole population was examined using total enumeration. The researcher developed a questionnaire tagged: Entrepreneurial Spirit, Office Technology and Management Graduates' Economic Engagement Questionnaire (ESOTMGEEQ) was used for data collection. This questionnaire was apportioned into two major sections such as A and B. Section focused on demographic characteristics of the respondents and B entailed the items regarding the level of entrepreneurial spirit, level of economic engagement among office technology and management graduates as well as graduates' economic engagement. The questionnaire received responses on four scale format, which was the modification of five Likert scales. However, three experts from Business Education (OTM option) from Tai Solarin University of Education, Ijagun, Ogun State) validated the instrument. All the issues and corrections raised were corrected before subjecting the questionnaire to the reliability testing. A total of 10 Business Education postgraduate students in Delta State University, Delta State participated in the pilot test of the study. The data recovered from the exercise were subjected to the Pearson Product-Moment Correlation (PPMC) formula. The reliability coefficient was reported as (r = .87). All the researchers fully participated in the study and permissions were taken from the authority of those universities selected. The respondents were briefed on the need for the study. However, a total of 281 copies of questionnaires were administered and only 269 were retrieved representing 95.7% as the retrieval rate. Descriptive statistics of mean, standard deviation and bar-chart were used for answering and presenting research questions 1 and 2. Research question 3 was answered using regression analysis. All the analyses were conducted as .05 level of significance.

Results

Research Question 1: What is the level of entrepreneurial spirit among office technology and management graduates?

Table 1: Responses on the level of entrepreneurial spirit among office technology and management graduates

Items	Mean	SD
I have passion to own my business	2.53	.906
Developing creative skills are not a problem for me	2.61	.976
I like to work as an entrepreneur rather than a public servant.	2.50	.926
Taking risk into businesses are not an issue to me,	2.23	.809
I always adopt to new business environment	2.55	.892
I have long term vision to own a private industry.	2.17	.899
To solve businesses challenges is not an issue to me.	2.66	.903
Developing innovative ideas in businesses is not a problem.	2.60	.933
Networking between my businesses and other related not a problem	2.54	.904
My sole aim is to achieve business sustainability.	2.52	.978
Cluster Mean	2.50	

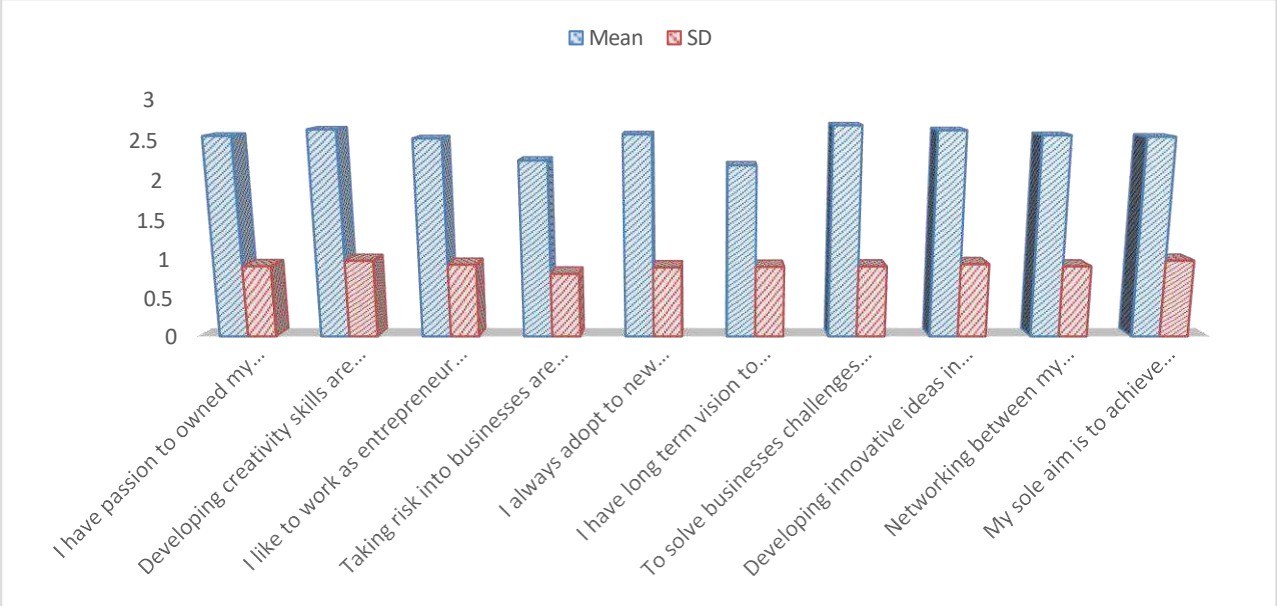

Figure 1: Bar-chart showing level of entrepreneurial spirit among office technology and management graduates

Table 1 revealed that cluster mean was 2.50 and the bench mark mean value was 2.50. Since, 2.50 = 2.50, this implied that OTM graduates have lower level of entrepreneurial spirit.

Research Question 2: What is the level of economic engagement among office technology and management graduates?

Table 2: Responses on the level of economic engagement among office technology and management graduates

Items	Mean	SD
Since I graduated, have being working with government.	2.67	.905
I engaged with private industry for a living,	2.93	.935
I find it difficult to work as entrepreneur.	2.08	.999
I owned my business.	3.03	.765
I am CEO of my enterprises.	3.11	.744
I am employer of labour	3.16	.760
I find it difficult to work with government.	2.01	.963
I am an apostle of graduates' economic self-reliance.	2.56	.904
I enjoyed been an entrepreneur	2.78	.867
Since I graduated, have not been economically engaged either in government, private or self.	2.33	.986
Cluster Mean	2.67	

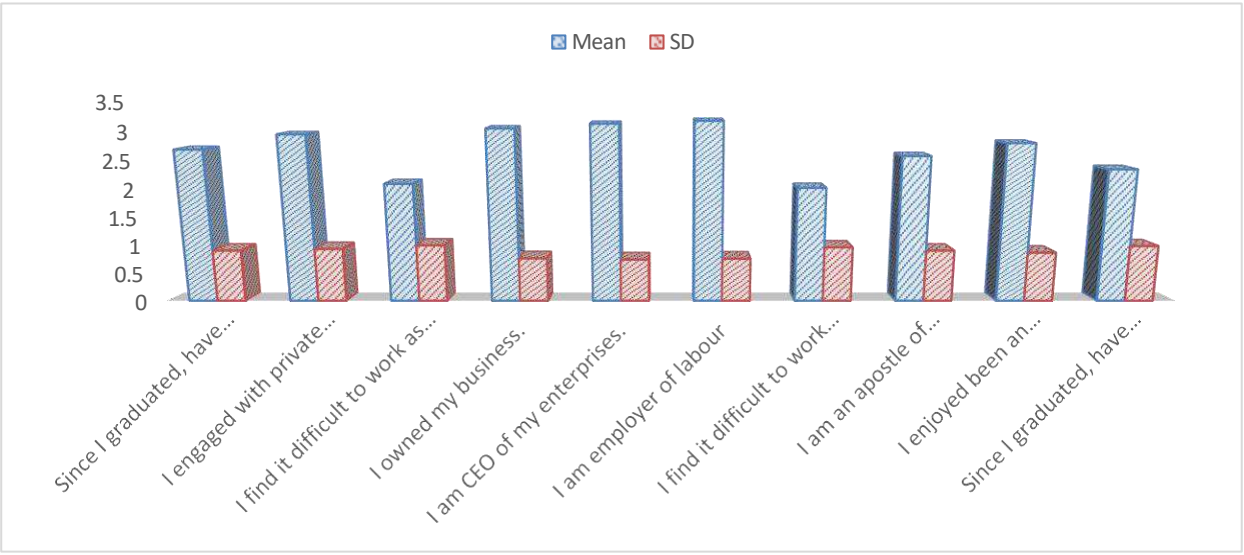

Figure 2: Bar-chart showing level of economic engagement among office technology and management graduates

Table 2 revealed that cluster mean was 2.67 and the bench mark mean value was 2.50. Since, 2.67 > 2.50, this implied that OTM graduates have lower level of economic engagement.

Research Question 3: To what extent entrepreneurial spirit could aid office technology and management graduates' economic engagement?

Table 3: Extent entrepreneurial spirit could aid office technology and management graduates' economic engagement

Model		Unstandardized Coefficients		Standardized Coefficients	t	P
		B	Std. Error	Beta		
1	(Constant)	34.569	2.972		11.631	.000
	Entrepreneurial spirit	1.699	.084	.791	20.345	.000

a. Dependent Variable: Graduates' economic engagement

Table 3 showed that the p-value less than 0.05 and magnitude of entrepreneurial spirit ($\beta = 0.791$, $t = 20.345$, $p < .05$). This implied that entrepreneurial spirit aid office technology and management graduates' economic engagement and that an increase in office technology and management graduates' economic engagement could be attributed towards entrepreneurial spirit.

Discussion of Findings

The findings of the study revealed that OTM graduates have lower level of entrepreneurial spirit. The implications of these results were that most graduates of OTM still need to develop more interest in entrepreneurial spirit that can further guarantee their economic engagement if white collar-job not available. These findings correlate with Fudamu *et al.,* (2024) who argued that engagement of graduates in today Nigeria mean to savage them from falling into circle of unemployment while Ikuenomore and Oludipe (2024) findings concluded that only vocational studies such as entrepreneurship education can equip graduates for economic self-sustenance. Adeyemi and Owoeye (2024) found that the graduates of OTM who have entrepreneurship skills such as spirit or positive mindset in favour of enterprises would surely possess direct effect on ability to enhance economic engagement.

The indicated that OTM graduates have lower level of economic engagement. This further entailed that the graduates of this discipline are becoming aware of the needs for them to be economic engaged in the labour market. These findings were in tandem with the findings of Mamman and Ogungboye (2023) who found that OTM programme is a kind of vocational programme that trained its recipients for future work engagement and career prospects. Ezechukwu *et al.,* (2021) believed that OTM programme has capability to develop economic engagement of its graduates by naturing them on how to be self-reliance, that is, OTM programme equipped its graduates with ability to venture into secretarial businesses for a living should white-collar job not available.

Finally, the findings revealed that entrepreneurial spirit aid office technology and management graduates' economic engagement and that an increase in office technology and management graduates' economic engagement could be

attributed towards entrepreneurial spirit. This further implied that graduates of OTM with solid entrepreneurial spirit have chances of become entrepreneurs and employer of labour. These findings were in consonant with Urbano and Aparicio (2015) who found that entrepreneurial skills have been engine developing graduates' ability towards economic self-reliance while Abiodun and Tijani (2023) indicated that entrepreneurial spirit dimension has potential impact on graduates' economic engagement.

Conclusion

The study concluded that graduates have lower levels of entrepreneurial spirit. The implications of these results were that most graduates of OTM still need to develop more interest in entrepreneurial spirit that can further guarantee their economic engagement if white collar-job not available. OTM graduates have lower level of economic engagement. This further entailed that the graduates of this discipline are becoming aware of the needs for them to be economic engaged in the labour market. Entrepreneurial spirit aid office technology and management graduates' economic engagement and that an increase in office technology and management graduates' economic engagement could be attributed towards entrepreneurial spirit.

Recommendations

Based on the findings of the study, the following recommendations are raised:

1. The stakeholders in OTM programme should incorporate the teaching and learning of entrepreneurial spirit into the curriculum of the discipline for effective instruction delivery.
2. Government through its agency like Bank of Industry (BOI) should develop a loan package for the graduates of OTM for venture into entrepreneurial businesses with single interest rate to reduce graduates' unemployment.

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ARTIFICIAL INTELLIGENCE AS A TOOL TO ENHANCE QUALITY TECHNICAL AND VOCATIONAL EDUCATION FOR SUSTAINABLE DEVELOPMENT IN THE PREVAILING UNCERTAINTIES IN NIGERIA

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ABSTRACT

This paper focused on Artificial intelligence as a tool to enhance quality technical and vocational education for sustainable development in the prevailing uncertainties in Nigeria. The concepts of artificial intelligence, technical and vocational education, and sustainable development were carefully discussed. It also examined the current prevailing uncertainties in Nigeria including the key components of quality technical and vocational education. The paper further discussed the benefits of quality technical and vocational education and the challenges facing technical and vocational education in Nigeria. The paper further discussed the applications of artificial intelligence in technical and vocational education, its benefits and challenges. The paper recommended amongst others that the Federal Government of Nigeria and private sectors should significantly invest in AI tools and training programs to support technical and vocational education institutions as adequate funding is essential for modernizing facilities, updating curricula, and training instructors so as to achieve the goals of Education in Nigeria. It was also recommended that technical and vocational educators should be trained regularly to enhance their technical expertise in AI and as well keep abreast with recent technological innovations; while policy makers should ensure equitable access to AI technologies across regions and demographics and formulate policies that prioritize investment in AI for education,

Keywords: Artificial intelligence, technical and vocational education, sustainable development

Introduction

Artificial Intelligence (AI) is a machine-based system that can make decisions, recommendations, or predictions for a given set of human-defined objectives (Organisation for Economic Co-operation and Development [OECD], (2019). The concept has been widely discussed by various researchers and scholars globally. It has been a popular topic of serious discourse at various conferences as researchers globally have tried to delve deeply into it to ascertain more information regarding its usability and suitability. AI is a trending concept that is currently impacting every industry in the world as it has been applied in several sectors including education, health, and agriculture. The development of Artificial Intelligence systems and technologies has been referred to as the 4th Industrial Revolution bringing in new opportunities to developing countries (Schwab, 2016). The European Commission (2018) describes Artificial Intelligence (AI) as systems that display intelligent

behavior by analyzing their environment and taking actions with some degrees of autonomy to achieve specific goals. AI is the study of agents that receive percepts from the environment and perform actions (Russell & Norvig, 2020).
Artificial intelligence is a tool created to improve human abilities and not necessarily to replace them. It cuts across several sectors displaying its usefulness in a variety of tasks. With AI, computer programs take up the intelligent role of humans and try solving significant problems. According to the International Finance Corporation (2020), AI is a very significant part of the solutions for eradicating poverty and increasing shared prosperity as it lowers the cost of and barriers to providing private sector solutions, has greater reach than traditional solutions, and drives investment opportunities in emerging markets. AI possesses significant potential to tackle several sustainable development goals (SDGs) by offering AI-as-a-service solutions or generating micro-level data through mobile phones and other electronic devices (Schwab, 2016).

Sustainable development refers to development that meets the needs of the present without compromising the ability of future generations to meet their own needs (World Commission on Environment and Development as cited in Olojuolawe, 2024). Sustainable development is the process of fostering economic growth while ensuring that natural resources are managed sustainably and benefits are shared equitably across generations (OECD, 2023). **The UN Environmental Programme (UNEP) (2022)** defines sustainable development as the process of developing in harmony with nature, where economic and social needs are met while protecting the environment for future generations. Raworth (2017) defines sustainable development as achieving a balance between meeting humanity's needs and operating within planetary ecological boundaries, creating a safe and just space for humanity. The UN describes sustainable development as achieving peace and prosperity for people and the planet, now and into the future, through the 17 Sustainable Development Goals (SDGs) focusing on economic, social, and environmental harmony (United Nations, 2015). According to the **International Institute for Sustainable Development (IISD) (2022),** sustainable development is the integration of environmental health, economic prosperity, and social equity to ensure a quality future for all through education.

Education is a process of acculturation through which individuals are trained to develop their potentials, talents and skills necessary for their overall development and that of their societies. It is a major indicator of knowledge and skills development, and thus has the potential for transforming and equipping individuals with the cognitive and innovative abilities which position them to contribute meaningfully to the overall development of their society. One of the forms of education which could be used by individuals to acquire both innovative and cognitive skills to be able to contribute meaningfully to sustainable national development is technical and vocational education. This is because it plays a very important role in equipping individuals with the requisite knowledge and skills for employability and self-reliance. Technical and vocational education encompasses organized activities designed to impart specific skills and technical knowledge that prepare individuals for employment in recognized trades and professions.
In Nigeria, technical and vocational education is seen as a critical tool for addressing youth unemployment, mitigating the effects of poverty, and fostering economic development. The term technical and vocational education in Nigeria often overlaps with technical and vocational education and training (TVET), which includes various programs that focus on equipping individuals with practical competencies for employment and entrepreneurship (Okoye & Arimonu, 2016). Nigeria, with its vast human and material resources, faces serious challenges such as high rates of unemployment, underemployment, mismatch between educational outcomes and labor market demands, and a high level of youth dependency on government employment. The importance of technical and vocational education in addressing these issues cannot be overemphasized, as it offers a viable and realistic pathway for individuals to achieve economic independence, self-reliance, and for the nation to achieve economic diversification and sustainable development.
The Federal Republic of Nigeria (FRN) (2013) describes technical and vocational education as a comprehensive term

referring to those aspects of the educational process involving in addition to general education, the study of technologies and related sciences and the acquisition of practical skills, attitudes, understanding and knowledge relating to occupations in various sectors of economic and social life. Technical and vocational education equips individuals with the technical abilities and skills needed to drive rapid industrialization. Abanyam et al. as cited in Okorieocha et al. (2024) opined that many countries of the world have considered technical and vocational education as relevant in empowering youths with practical skills that will enable them engage in productive livelihoods. Ibe (2016) noted that programmes under technical and vocational education include but not limited to; Industrial Technology Education, Agricultural Science Education, Home Economics Education, Computer Education, and Business Education. Technical and vocational education is an integral part of all inclusive education for all types of initiative which helps an individual to become an active citizen and contribute positively to his own wellbeing and to the economic growth of the society (Okorieocha et al., 2024). This implies that technical and vocational education is very important and could be used as an avenue to achieve the Sustainable Development Goals (SDGs).

The United Nations (2015) formulated and ratified the 17 Sustainable Development Goals (SDGs) within the 2030 Agenda for Sustainable Development, which inherently encompasses technical and vocational education. In Goal 4: "ensuring inclusive and quality education for all and promoting lifelong learning," one specific target pertaining to technical and vocational education is "to substantially increase the number of youths and adults who possess relevant skills for employment, decent jobs, and entrepreneurship." These objectives are to be accomplished by the year 2030. Technical and vocational education is an educational pathway that prepares individuals for specific trades, crafts, and careers at various levels, including secondary, post-secondary, and adult education. It focuses on providing students with the practical skills and knowledge required to succeed in a particular job or career. Unlike traditional academic education, technical and vocational education emphasizes hands-on experience and specialized knowledge in a particular field, such as plumbing, electrical work, welding, and information technology (Kis & Weko, 2020).

The Nigerian government has implemented several initiatives to revitalize vocational education such as; **National Vocational Qualification Framework (NVQF) which p**rovides a standardized system for assessing and certifying vocational skills, the **Industrial Training Fund (ITF) which s**upports internships and practical training programs for students and workers and the **National Directorate of Employment (NDE)** which offers skill acquisition programs and entrepreneurship training to unemployed youth. The private sector and Non-Governmental Organisations (NGOs) have significantly contributed to vocational education in Nigeria. Companies such as Dangote Group and NGOs like the Skills Development Initiative Nigeria offer training programs and collaborate with vocational institutions to enhance the quality of education.

Despite the relevance of vocational education and the efforts targeted towards revitalizing vocational education in Nigeria, there seems to be little or no improvement especially with regards to unemployment, poverty and insecurity in the country. This therefore calls an urgent need for quality technical and vocational education with emphasis on modern technology such as artificial intelligence (AI). Quality is defined as the act of superiority in kind (Merriam Webster Dictionary, 2024). Quality refers to a distinguishing attribute of excellence. In the context of this study, quality technical and vocational education could be referred to as well structured and organized activities in addition to relevant teaching methods and modern facilities designed to impart specific skills and technical knowledge that prepare individuals for employment in specific trades and professions. Quality technical and vocational education ensures that learners acquire relevant, up-to-date skills aligned with labor market demands and global best practices.

Quality technical and vocational education refers to training programs that meet the current and future needs of learners, industries, and society, preparing individuals for meaningful employment and lifelong learning. According to UNESCO (2020), quality technical and vocational education should integrate technical knowledge, practical skills, and core competencies such as problem-solving, communication, and adaptability. These programs must be responsive to economic trends, technological advancements, and local labor market dynamics to remain relevant and effective. In the Nigerian context, technical and vocational education is enshrined in the National Policy on Education, which defines it as education designed to prepare learners for specific trades, crafts, and careers at various levels of employment (Federal Republic of Nigeria, 2013). The emphasis is on hands-on training and theoretical knowledge, ensuring that graduates can meet industry standards and contribute to economic development.

Technical and vocational education which includes automobile technology education, building technology, electrical/electronic technology, metalwork technology, and woodwork technology among others, offers students job-specific skills and knowledge relevant to the needs of the industries. Thus, technical and vocational education students are expected to be fully equipped to face realities of the world of work and as well have the ability to solve complex challenges in the industries. In the 21st century especially with the emergence of industry 4.0, technical and vocational education should not be left behind but instead should be abreast with latest global innovations like artificial intelligence. Thus, for a successful adaptation to these global innovations, technical and vocational education should promote life-long vocational learning, the willingness and ability to change, and the ability to handle complex challenges (Windelband, 2023).

Key Components of Quality Technical and Vocational Education

1. **Dynamic Curriculum:** Quality technical and vocational education requires a dynamic curriculum that reflects industry needs. Regular reviews and collaboration with stakeholders such as employers, trade unions, and policymakers ensure that the curriculum remains relevant and aligned with recent technological advancements (OECD, 2019). For instance, courses on automation, artificial intelligence, and renewable energy have become critical in technical and vocational training due to their growing importance in the global economy. This highlights the importance of a robust and comprehensive curriculum to promote quality technical and vocational education.
2. **Quality Educators:** Highly experienced instructors with 21st century technical expertise and pedagogical skills are central to delivering quality technical and vocational education. According to Okebukola (2022), teacher training programs should focus on up-skilling technical and vocational educators in modern instructional methods and technological tools to improve the teaching-learning process.
3. **Modern Practical Instructional Facilities:** Quality technical and vocational education encompasses the availability of modern practical training facilities. Access to state-of-the-art facilities and equipment is crucial for experiential learning. Quality vocational and technical institutions must simulate real-world environments where learners can practice and perfect their skills. For example, automotive workshops, digital fabrication labs, and agricultural training centers are essential for providing hands-on experience (UNESCO-UNEVOC, 2021).
4. **Accreditation and Standardization:** Quality technical and vocational education should ensure proper accreditation and standardization. Standardized assessment frameworks and accreditation processes ensure that technical and vocational education meets established quality benchmarks. Institutions must adhere to guidelines set by national and international regulatory bodies to guarantee consistency and quality in their training programs (International Labour Organization, 2019).

5. **Soft Employability Skills Training:** Soft employability skills should be incorporated while training individuals in technical and vocational education to ensure the quality of graduates to be produced. In addition to technical skills, quality technical and vocational education emphasizes the development of soft skills, including teamwork, leadership, and communication. These skills enhance employability and adaptability, allowing graduates to thrive in diverse work environments (World Bank, 2020).

Benefits of Quality Vocational and Technical Education

Quality vocational and technical education contributes to economic growth by addressing skills shortages in key sectors. In Nigeria, industries such as agriculture, construction, and information technology require a steady supply of skilled workers to drive productivity and innovation (Adeyemi & Oluwole, 2021). By equipping individuals with relevant skills, technical and vocational education enhances labor market efficiency and reduces unemployment.

1. **Self-Reliance and Empowerment Opportunities:** Quality technical and vocational education provides significant opportunities for individuals to gain employment or start their businesses, thereby improving their economic status. According to the International Labour Organization (2019), technical and vocational education is a powerful tool for breaking the cycle of poverty, particularly in developing countries like Nigeria.
2. **Social Inclusion:** Technical and vocational education plays a pivotal role in promoting social inclusion by providing marginalized groups, such as women, persons with disabilities, and out-of-school youth, with access to skills training. These programs empower individuals to contribute to society and improve their quality of life (UNESCO, 2020). Through quality technical and vocational education, technological advancement is evident.
3. **Technological Innovation and Advancement:** Quality technical and vocational education fosters technological innovation by training individuals to use and develop cutting-edge technologies. For instance, integrating artificial intelligence (AI) and automation into vocational training programs prepares graduates to meet the demands of Industry 4.0 (Nguyen et al., 2020).

Challenges to Quality Technical and vocational education in Nigeria

1. **Insufficient Funding and Lack of Political and Administrative Efforts by Government:** One of the significant barriers to quality technical and vocational education in Nigeria is insufficient funding. Many vocational institutions operate with outdated equipment and facilities due to a lack of financial resources (Okebukola, 2022). The federal government and state governments are yet to give technical and vocational education the attention it deserves to drive technological development in the country. This limited investment hinders the ability to provide learners with practical, hands-on experience.
2. **Skills Mismatch:** Many graduates of technical and vocational education are not able to meet the demands of the industries due to the lack of relevant employability skills. Thus, the gap between technical and vocational education and labor market demands remains a critical issue in Nigeria. Outdated curricula, limited industry involvement in program design and lack of strong collaboration between industry and institutions result in the production of graduates that lack the skills needed for emerging sectors (Adeyemi & Oluwole, 2021).
3. **Negative Public Perception:** Technical and vocational education often suffers from negative societal perceptions, with many viewing it as a less prestigious alternative to academic education. This bias discourages enrollment in vocational programs thereby reducing their impact on workforce development (UNESCO-UNEVOC, 2021).
4. **Lack of Sufficient and Qualified Educators:** A shortage of qualified technical and vocational educators, coupled with limited opportunities for professional development, affects the quality of instruction. Many educators lack the technical and pedagogical skills required to deliver effective training (World Bank, 2020).

5. **Inadequate Technology Integration in Instructional Delivery:** Limited technology integration such as artificial intelligence also poses great challenges to achieving quality technical and vocational education. The lack of digital infrastructure and technological resources in many Nigerian vocational institutions limits the adoption of modern teaching methods. This gap prevents learners from acquiring the digital skills essential for the contemporary workforce (Nguyen et al., 2020).

Artificial Intelligence as a Tool for Enhancing Quality Technical and vocational education in Nigeria

Technical and vocational education plays a critical role in addressing unemployment and fostering economic development. However, in Nigeria, the quality of technical and vocational education is hindered by challenges such as inadequate infrastructure, limited access to quality training, and an unpredictable socio-economic environment. The advent of Artificial Intelligence (AI) presents transformative opportunities to bridge these gaps and enhance the quality of technical and vocational education. AI tools can personalize learning, streamline administrative processes, automate routine tasks, and provide data-driven insights for improved decision-making (Luckin et al., 2016). Integrating AI into technical and vocational education aligns with global efforts to achieve Sustainable Development Goal (SDG) 4, which emphasizes quality education for all. The integration of Artificial Intelligence (AI) into education systems has the potential to revolutionize the delivery and quality of technical and vocational education in Nigeria.

The application of AI in education has been widely studied, with evidence suggesting significant benefits in improving learning outcomes and operational efficiency. According to Holmes et al. (2019), AI can personalize educational content to meet the diverse needs of learners. In technical and vocational education, AI tools such as simulations and virtual reality (VR) enhance practical skill acquisition by providing safe, controlled environments for learners to practice complex tasks. AI technologies can play a pivotal role in achieving SDG 4 by improving the accessibility and quality of education. For instance, AI-driven analytics can identify skill gaps in the labor market and inform curriculum development to ensure alignment with industry needs (Nguyen et al., 2020).

Applications of Artificial Intelligence (AI) in Technical and vocational education

Artificial Intelligence (AI) has become a transformative force across numerous sectors, including technical and vocational education. Below are some applications of AI in technical and vocational education;

1. **Learner-Centered and Adaptive Learning Platforms:** AI applications in this field focus on enhancing learning experiences, improving instructional efficiency, and equipping learners with skills relevant to the 21st-century job market. AI-powered systems can create customized learning experiences for students based on their unique needs, preferences, and abilities. Adaptive learning platforms use AI algorithms to analyze learners' progress and recommend tailored content to address specific gaps in knowledge or skills (Chen et al., 2021). For example, an AI-enabled platform can adjust the pace and complexity of a welding or electrical/electronics course to suit individual learners.
2. **Simulated Training and Virtual Reality:** AI also provides Virtual Reality (VR) and simulated training. Technical and vocational education requires hands-on experience, and AI integrated with VR provides realistic simulations of workplace environments. In fields such as automotive repair, construction, or healthcare, learners can practice in virtual scenarios that mimic real-world tasks without the associated risks or costs (Martínez & Hernández, 2020). AI enhances these simulations by making them more interactive and responsive to students' actions.
3. **Automated Assessments and Feedback:** AI ensures automated assessment and feedback. AI systems can automate the evaluation of learners' performances, thereby providing instant and objective feedback. For instance, AI-based tools can assess technical skills such as coding or graphic design by analyzing submitted projects against predefined standards (García-Peñalvo et al., 2019). This reduces instructors' workload and ensures timely feedback for students to improve.

4. **AI-Powered Virtual Tutors and Chatbots:** In addition an all-inclusive learning platform, AI-powered virtual tutors and chatbots provide all-round assistance to learners, answering queries, explaining concepts, and guiding them through coursework. These tools are particularly useful in technical and vocational education, where learners may need assistance with technical problems outside regular class hours (Zawacki-Richter et al., 2019).
5. **Predictive Analytics for Vocational and Career Guidance:** AI supports Predictive Analytics for Career Guidance. AI systems analyze market trends and labor demands to guide students toward in-demand vocational skills. For example, machine learning algorithms can process large datasets to predict emerging job roles in renewable energy, digital manufacturing, or AI itself, helping students choose appropriate vocational paths (Hussin et al., 2021).
6. **Skill Development Tools and Machines:** AI also promotes skill development through AI-driven tools. AI-based tools such as 3D printers, Computer Numerical Control (CNC) machines, and smart diagnostic systems are becoming integral to technical and vocational education. These tools train students in industry-specific skills, such as precision engineering or advanced manufacturing, by providing real-time feedback and analytics (Yu et al., 2020).
7. **Learner Analytics:** Learning analytics powered by AI helps educators track students' progress, identify at-risk learners, and optimize instructional strategies. AI systems can identify patterns in students' behavior, such as declining engagement, and recommend interventions to prevent dropouts (Siemens et al., 2020).
8. **Hybrid Learning Solutions:** AI supports remote and hybrid learning solutions**.** AI facilitates remote vocational training through platforms that enable virtual labs, real-time collaboration, and AI-driven assessments. For instance, cloud-based AI systems allow learners in rural areas to access high-quality vocational training programs (Garrison et al., 2021).
9. **Curriculum Design and Content Creation:** AI facilitates content creation and curriculum design. AI assists educators in creating engaging and relevant learning materials by analyzing industry trends and learner preferences. Tools like Natural Language Processing (NLP) generate quizzes, instructional videos, and manuals, saving time and ensuring alignment with industry standards (Bates et al., 2020).
10. **Learner Inclusiveness:** AI technologies promote inclusivity by accommodating learners with disabilities. For example, AI-driven speech recognition tools support learners with hearing impairments, while text-to-speech systems assist those with visual challenges. This ensures equal access to technical and vocational education for diverse populations (McLaughlin & Knoop, 2020).

Challenges of Artificial Intelligence (AI) in Technical and vocational education

The integration of artificial intelligence (AI) into technical and vocational education has the potential of revolutionizing the teaching and learning processes in Nigeria by offering significant advancements in skill development and training efficiency. However, it comes with notable challenges that hinder its seamless adoption and impact. Addressing these challenges will require significant investment in infrastructure and training programs, as well as policies and regulations to ensure that AI is used ethically and responsibly.

1. **High Cost of Implementation and Maintenance:** One of the significant challenges facing AI integration in technical and vocational education in Nigeria is the high cost of implementation and lack of infrastructure and resources needed. AI technologies require substantial investment in hardware, software, and infrastructure. Thus, the cost of implementing AI can be exhaustive, making it challenging for institutions to invest in the technology (UNESCO, 2019). Vocational institutions often face budgetary constraints, making it difficult to procure AI tools and maintain them. For example, installing AI-powered simulators or adaptive learning platforms demands significant upfront costs, limiting access for underfunded schools (Hussin et al., 2021).
2. **Lack of Modern Infrastructure and Equipment:** Many technical and vocational education institutions in Nigeria lack the necessary equipment, such as computers and internet connectivity, to integrate AI effectively. Technical and

vocational education, particularly in developing countries like Nigeria, struggles with inadequate infrastructure, such as unreliable electricity, poor internet connectivity, and limited access to advanced technologies. This digital divide prevents widespread integration of AI systems into training programs (Siemens et al., 2020).

3. **Lack of AI Experts and Qualified Trainers:** Another significant challenge is the lack of qualified trainers and AI experts in Nigeria. While AI has the potential to contribute immensely to the sustainable development in Nigeria, it requires skilled experts to develop and implement AI-based programs. However, there is a shortage of such experts in Nigeria, and training programs are often inadequate. This makes it difficult to integrate AI effectively into technical and vocational education programs (African Union, 2019). Educators and trainers often lack the technical expertise required to effectively integrate and utilize AI tools in technical and vocational education. Training educators to operate and troubleshoot AI systems, such as machine learning algorithms or AI-driven simulators, is a time-intensive and costly process (García-Peñalvo et al., 2019).

4. **Ethical Considerations and Data Privacy Concerns:** A major and critical challenge that has made researchers and experts react negatively to AI is its ethical implications. AI systems are only as unbiased as the data they are trained on. If vocational training platforms use datasets that contain biases, it may result in unequal opportunities for learners. For instance, an AI-powered recruitment platform might favor candidates trained using specific tools, perpetuating inequality (Binns et al., 2018). Additionally, privacy concerns arise with the collection and use of learners' data and the potential for misuse of this data (UNESCO, 2019).

5. **Resistance to Modern Trends by Educators:** The adoption of AI technologies often encounters resistance from educators, administrators, and even students due to fear of job displacement, skepticism about its effectiveness, and reluctance to adopt new teaching methods. Many educators worry that AI could replace traditional instructional roles (Zawacki-Richter et al., 2019). Also, several technical and vocational education curricula are not designed to accommodate AI integration. Aligning traditional teaching materials with AI-powered platforms requires curriculum redesign, which is a complex and time-consuming process (Martínez & Hernández, 2020). AI in technical and vocational education can inadvertently widen the gap between privileged and underprivileged groups. Students in rural areas or low-income regions may lack access to AI-based training tools, exacerbating educational inequalities (Garrison et al., 2021).

6. **Students' Over-Reliance on Technology:** In the nearest future, students may over-depend on Technology and this could pose a huge threat to human interactions. Over-reliance on AI systems may lead to reduced human interaction and mentorship in vocational training. Soft skills, such as teamwork, communication, and leadership, often require interpersonal engagement, which AI systems cannot fully replicate (Hussin et al., 2021).

7. **Global Security Concerns:** AI also poses security and data privacy risks as large amounts of data are being processed and used by these systems. The use of AI involves collecting and storing large amounts of personal and performance data from students. Weak cyber security measures can lead to data breaches, exposing students to risks such as identity theft or misuse of information (Chen et al., 2021). Additionally, AI technologies evolve rapidly, and vocational institutions may struggle to keep up with these changes. Tools and systems implemented today may become outdated in a few years, necessitating frequent updates and reinvestments (Yu et al., 2020).

Conclusion

Technical and vocational education is a critical component of Nigeria's education system, offering a pathway to employment, entrepreneurship, and economic development. AI can revolutionize technical and vocational education by enabling personalized learning, enhancing skill development, and aligning training programs with industry demands. Integrating AI into technical and vocational education offers a transformative approach to addressing Nigeria's education challenges. By leveraging AI, the sector can improve its quality, align with global standards, and contribute to sustainable

development. However, achieving these outcomes requires concerted efforts to address the existing barriers. By focusing on equity, ethical practices, and capacity building, technical and vocational education can adopt AI as a medium to bridge skill gaps and prepare learners for the future workforce. By investing in infrastructure, changing societal perceptions, and aligning training with labor market needs, Nigeria can unlock the full potential of technical and vocational education.

Recommendations

1. The Federal Governments of Nigeria and private stakeholders should invest in AI tools and training programs to support technical and vocational institutions as adequate funding is essential for modernizing facilities, updating curricula, and training instructors. This will help institutions leverage the benefits of AI thereby promoting technological advancement in the nation.
2. Technical and vocational educators should be trained regularly to enhance their technical expertise in AI and as well keep them abreast with recent technological innovations. Incorporating digital tools and e-learning platforms can enhance the quality of vocational training and make it more accessible.
3. Policymakers should ensure equitable access to AI technologies across regions and demographics and also formulate policies that prioritize investment in AI for education. Regular reviews of technical and vocational education policies are necessary to adapt to evolving economic and industrial needs.
4. Institutions should adopt transparent data policies and use diverse datasets to minimize bias in AI systems. Technical and vocational education institutions should adopt and implement the recommendations of the OECD on the ethical use of AI to foster innovation and trust in AI by promoting the responsible stewardship of trustworthy AI while ensuring respect for human rights and democratic values.
5. Technical and vocational education institutions should collaborate with technology companies to develop affordable AI solutions. Strengthening partnerships between vocational institutions and industries can also ensure that training aligns with labor market demands.

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ACHIEVING OPTIMAL LEARNING OUTCOME IN MODERN DAY TEACHING OF SENIOR SECONDARY SCHOOL GEOGRAPHY IN NIGERIA

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ABSTRACT

Geography, though vital in Nigeria's secondary school curriculum, is increasingly marginalized, leading to declining student interest and performance. This study explores strategies to enhance learning outcomes in senior secondary school geography through modern pedagogical practices. A descriptive research approach was employed, involving 150 students and 30 teachers from public schools in Lagos State. Data were collected via structured questionnaires and analyzed using descriptive statistics. Findings revealed that inadequate instructional materials, limited teacher training, and disengaging classroom environments significantly hinder effective geography learning. Both students and teachers acknowledged the importance of instructional resources in improving comprehension, engagement, and academic performance. To achieve optimal learning outcomes, the study recommends integrating student-centered strategies such as inquiry-based learning, real-world case studies, and digital tools. Continuous teacher training and improved access to instructional materials are also essential for revitalizing geography education in Nigeria.

Keywords: **Geography education, learning outcomes, instructional materials, student engagement, Nigeria, secondary school, teacher training.**

Introduction

The concept 'learning outcome' is a controversial term to define as it has the tendency to mean different things to different people based on the context in which it is used. According to Yurdugül and Menzi (2015) learning outcome refers to a set of observable and demonstrable statements about what the learner knows and understands at the end of the learning experience. Mahajan et al. (2017) on another hand sees it as statements of what a learner is expected to know, understand and/or be able to demonstrate after completion of a process of learning. Oxnard College (2021) lends credence to this last definition by stating that learning outcomes should be what students are expected to know, be able to do or be able to demonstrate when they have completed or participated in a course or programme which are essentially observable, measurable and can easily be demonstrated. Ramzi and Biju (2022) on their own, assert that learning outcomes can be framed through knowledge; skills and competencies acquired and demonstrated when students complete a programme. From all these assertions, it can be said that learning outcomes are all the observable changes in all the domains of learning i.e. attitude, interest, values, skills, competencies and knowledge (achievement and performance) which apparently serve

as measure of its actualization. A learning experience on the other hand is an event or situation that leads to a revelation or lesson, or deep insights. “That was quite a learning experience”. We can infer from this quote that the ideas, thoughts and experiences from such an event are usually long lasting, emotionally moving, or insightful and also applicable in various aspects of life, or in varying domains.

There is no doubt that Geography stands out as an important subject in the secondary school curriculum, even though it has gradually been relegated to the background in modern day Nigeria as an optional subject. According to Okpala (2000), cited in Odeyemi (2021), any subject that is not termed essential at any educational level in any educational system has to work extra mile for its continued existence. Such a subject may be phased out if it lacks clientele (students). It could also be relegated to the background if an allied subject is thought to be more relevant to the citizens at that point in time. Geography is facing this threat (Odeyemi Oyelekan Adeyemo 2021). Apart from its multi-disciplinary nature which provides wider knowledge and skills to the learner to understand and exploit his immediate environment, its global relevance cannot be over-emphasized. Geography according to Odeyemi (2021) as a school subject is versatile, expressive and intellectually stimulating and thus exhibits a correlation with all school subjects. It therefore instils in the student the need to appreciate and develop a sense of responsibility towards their own society. Geography studies the origin of the physical and human phenomena of the earth's surface, the processes that change them and have brought them to the present state, and arranged them in space in the way they exist without forgetting to analyse the implications of the location and arrangement of these phenomena for human beings. To ensure its effective learning there must definitely be effective teaching, in which the teacher must be effective in delivery of facts and content. A teacher’s effectiveness in the geography classroom incorporates all the attributes he/she needs to effectively utilize in the course of instruction. These include: Mastery of subject matter, educational qualification and area of specialization, years of professional teaching experience, appropriate use of available teaching materials, use of proper evaluation techniques to mention but a few. The teaching and learning of Geography as a secondary school subject has over the years taken on a new perspective and approach in the Nigeria school curriculum. A few issues have successfully taken over the teaching and learning of senior secondary school Geography in Nigeria as a result of the review of the curriculum and the place of Geography in the senior secondary school, and they include: the new integrative Geography curriculum, the achievement of sustainable development goals through the teaching and learning of Geography, the changing nature of geography and geographical knowledge from a phenomenal or declarative one to an intellectual one, the current place of near extinction of Geography in the Nigeria secondary school curriculum and the need to achieve optimal learning outcomes in modern day teaching of Geography for national development.

For students to learning geography effectively, teachers are required to link the subject matter of learning with more contextual and practical examples so that students will get an overview of integration in the acquisition of learning outcomes. Contextual understanding either from practical examples or simulations can improve student learning outcomes in achieving learning objectives (understanding of subject matter) that are relevant or irrelevant to them and meaningful in their lives. Modern day Geography teachers, must therefore get used to conducting scientific and realistic discussions to improve interpersonal intelligence which in turn will have a positive effect on improving the quality of learning and cumulate in achieving optimal learning outcome. In as much as student’s achievement in any teaching-learning situation is very important, it has been observed and research shown over the years that, the performance of Nigerian senior secondary school students in Geography has not been very encouraging, but has consistently taken a nose-dive as highlighted and reported by chief examiners and moderators of external examinations in the country. The importance of Instructional Materials in any teaching and learning process cannot be over emphasized. This is for the fact that such materials enhance, facilitate and make teaching and learning easy, lively and concrete (Olawale, 2013). The use

of instructional facilities to aid instruction is key in the teaching-learning process because it not only enhances learning experiences but also encourages the active interaction of stakeholders within a school (Olayemi and Amosun, 2024). Instructional Materials in geography as the name suggests, are all those materials of visual, audio and audio - visual category that help to make concepts, abstracts and ideas concrete in the teaching and learning process. They are materials which the geography teacher uses in supplementing his teachings to facilitate learning, because the teaching of geography cannot be done effectively without them. Adebisi (2004) stated that instructional materials are very important so that students can imagine accurately and interpret correctly the features of this great world. Hence, Instructional materials provide more realistic learning experiences than the verbal abstractions that students go through in a talk and chalk classroom. They motivate students to learn and encourage active participation.

Statement of Problem

Despite the importance of geography education in Nigeria, secondary school students' performance in the subject remains a concern. This is mainly due to the place of the subject amongst other school subject as optional for only science students. Some other areas of concern contributing to suboptimal learning outcomes include the traditional teaching methods adopted by most teachers, inadequate resources and instructional materials, and lack of teacher training and competency. This study aims to investigate the factors influencing learning outcomes in secondary school geography and explore strategies for achieving optimal learning outcomes.

Research Objectives

The main objective of this research is to ensure the achievement of optimal learning outcome in modern day teaching of senior secondary school geography in Nigeria. Other objectives are to:

1. identify the challenges facing the teaching and learning of Nigeria senior secondary school Geography.
2. determine the factors responsible for the poor performance and poor learning outcomes amongst senior secondary school Geography students.
3. determine the role of instructional materials and resources in enhancing students' learning outcomes in Geography
4. propose some strategies that can be adopted by teachers to promote active learning, critical thinking and problem-solving skills in geography classrooms.

Research Questions

1. What are the current challenges facing the teaching and learning of geography in Nigerian secondary schools?
2. What are the factors influencing students' poor performance and poor learning outcomes in geography?
3. What role do instructional materials and resources play in enhancing students' learning outcomes in geography?
4. What strategies can teachers employ to promote active learning, critical thinking, and problem-solving skills in geography classrooms?

Literature Review

The Geographic Education National Implementation Project (GENIP) Framework

The Geographic Education National Implementation Project (GENIP) Framework represents a collaborative initiative aimed at enhancing geographic literacy and education across the United States. Established by leading geographic organizations such as the American Association of Geographers (AAG), the National Council for Geographic Education (NCGE), and the National Geographic Society (NGS), GENIP has played a pivotal role in shaping national standards and promoting the integration of geography into K–12 curricula. One of its most significant contributions is the development and dissemination of Geography *for Life: National Geography Standards*, which emphasize spatial thinking, place-based learning, and the use of geospatial technologies in education.

The GENIP Framework is grounded in the belief that geographic literacy is essential for informed citizenship in an increasingly interconnected world. It advocates for a curriculum that not only teaches geographic content but also

cultivates critical thinking and problem-solving skills through the lens of spatial relationships and human-environment interactions. This approach aligns with broader educational goals, including the development of global competencies and the ability to analyze complex systems. GENIP's influence is evident in the widespread adoption of Advanced Placement (AP) Human Geography, which has introduced thousands of high school students to rigorous geographic study and has helped legitimize geography as a core academic discipline.

Research associated with GENIP also highlights the importance of teacher preparation and professional development. For instance, Hinde, Osborn Popp, Jimenez-Silva, and Dorn (2011) explored the GeoLiteracy program, which integrates geography with literacy instruction for English Language Learners. Their findings revealed that students who engaged with geography-based lessons showed improved or sustained reading comprehension, demonstrating the interdisciplinary value of geography education.

Despite its successes, the GENIP Framework faces several challenges. One major issue is the uneven implementation of geography standards across states, which leads to disparities in geographic knowledge and skills among students. Additionally, many teacher education programs do not adequately prepare future educators to teach geography, resulting in a lack of confidence and competence in delivering geographic instruction. Furthermore, geography often receives limited attention in standardized testing and STEM-focused educational reforms, which can marginalize its role in the broader curriculum. Looking ahead, GENIP aims to address these challenges by advocating for stronger policy support, expanding access to geospatial technologies, and promoting interdisciplinary curricula that connect geography with science, technology, engineering, and mathematics. The framework also emphasizes the need for ongoing research to evaluate the effectiveness of geographic education initiatives and to inform best practices in teaching and learning. By continuing to build partnerships among educators, researchers, and policymakers, GENIP seeks to ensure that geography remains a vital and dynamic component of 21st-century education.

Geographic Literacy and Inquiry-Based Learning in Secondary Education

The development of geographic literacy is essential for equipping students with the knowledge, skills, and perspectives necessary to understand and engage with the world around them. Geographic literacy refers to the ability to think spatially and make meaningful connections between people, places, and environments (Bednarz & Bednarz, 2004). A key component of this literacy is geographic inquiry, which encourages students to explore geographic questions through investigation, analysis, and problem-solving. This inquiry-based approach fosters deeper engagement and promotes critical thinking by allowing students to construct knowledge through real-world exploration (National Geographic Society, 2013). Another vital dimension is the examination of geographic issues, such as environmental sustainability, economic development, and social justice. By engaging with these complex, real-world challenges, students develop not only analytical skills but also the capacity for informed decision-making and civic responsibility (Solem, Huynh, & Boehm, 2014).

The Conceptual Framework of Geographic Literacy, as adapted from geography education research and promoted by organizations such as the Association of American Geographers and Esri, is structured around three core dimensions:

1. Geographic Knowledge: Understanding key concepts such as location, place, spatial relationships, and human-environment interactions (Gersmehl, 2008).
2. Geographic Skills: The ability to interpret and analyze geographic data using tools such as maps, spatial analysis, Geographic Information Systems (GIS), and remote sensing (Esri, 2024).
3. Geographic Perspectives: The capacity to consider multiple viewpoints and values when addressing geographic problems, thereby enhancing critical thinking and ethical reasoning (Bednarz, 2003).

This framework provides a robust lens for examining how geography teachers design and implement lessons that promote

literacy, inquiry, and issue-based learning. It also offers valuable insights into the factors influencing learning outcomes in secondary school geography, particularly in contexts like Nigeria where curriculum reform and teacher training are ongoing challenges. By integrating geographic knowledge, skills, and perspectives into classroom instruction, educators can foster a more holistic and transformative learning experience. This approach not only enhances academic achievement but also prepares students to navigate and contribute to an increasingly interconnected and dynamic world.

Theories of Learning and Instruction

1. Cognitive Load Theory – John Sweller

Cognitive Load Theory (CLT), developed by John Sweller in the late 1980s, emphasizes the limitations of working memory and the importance of instructional design in facilitating effective learning. Sweller (2011) argues that learners can only process a limited amount of information at a time, and instructional materials that overload working memory can hinder learning. CLT categorizes cognitive load into three types:

Intrinsic Load: The inherent complexity of the material being learned.

Extraneous Load: The unnecessary cognitive effort imposed by poorly designed instructional materials.

Germane Load: The mental effort dedicated to processing, constructing, and automating schemas.

Effective teaching, according to CLT, involves reducing extraneous load and optimizing germane load to support schema development. This theory is particularly relevant in classroom settings where complex content must be broken down into manageable chunks to enhance comprehension and retention (Sweller, Ayres, & Kalyuga, 2011).

2. Information Processing Theory – Atkinson & Shiffrin

The Information Processing Theory, proposed by Atkinson and Shiffrin (1968), conceptualizes learning as a process involving the flow of information through a series of memory systems: sensory memory, short-term (working) memory, and long-term memory. According to this model:

Encoding: Information from the environment is initially registered in sensory memory and then encoded into short-term memory.

Storage: With rehearsal and meaningful association, information is transferred to long-term memory.

Retrieval: Stored information is accessed when needed for problem-solving or decision-making.

This theory highlights the importance of instructional strategies that support attention, rehearsal, and meaningful learning. Techniques such as chunking, repetition, and the use of mnemonic devices are grounded in this model and are widely used to enhance memory retention and recall in educational contexts (Ormrod, 2016).

Methodology

This study employed a descriptive research design to provide a comprehensive understanding of how optimal learning outcomes can be achieved in the modern-day teaching of senior secondary school geography in Nigeria. The target population for the study consisted of senior secondary school geography students and teachers across Nigeria. The estimated population size for students is approximately 57,624 and the estimated population size for teachers is approximately 11,525. The total number of senior secondary school geography students and teachers in the accessible population from which your sample. However, for practical and logistical reasons, the sample was drawn specifically from public senior secondary schools located in Yaba Local Government Area of Lagos State. To determine the appropriate sample size, a standard estimation formula was applied, assuming a 50% response distribution, a 5% margin of error, and a 95% confidence level. Based on this calculation, the study sampled 150 students and 30 teachers. A simple random sampling technique was adopted to ensure that every individual in the accessible population had an equal chance of being selected, thereby enhancing the representativeness of the sample. Data collection was conducted using two primary instruments. The student questionnaire was designed to collect information on students' prior knowledge of geography, their motivation and interest in the subject, and their overall learning experiences and classroom engagement.

The teacher questionnaire, on the other hand, focused on gathering data regarding teachers' academic qualifications, professional training, teaching practices, instructional methods, and the availability and use of instructional materials and technology. Both questionnaires were administered online to facilitate broader participation and streamline the data collection process. The data collected from the questionnaires were analyzed using descriptive and inferential statistics.

Results

Research Question 1: What are the current challenges facing the teaching and learning of geography in Nigerian secondary schools?

Table 1: Challenges facing the teaching and learning of geography in Nigerian secondary schools

Students

Item	Mean	SD
1.I find geography lessons engaging and interesting.	3.09	1.41
2. I understand the concepts taught in geography class.	2.85	1.50
3. I have access to sufficient learning materials for geography.	3.01	1.39
4. The classroom environment is conducive to learning geography.	2.98	1.37
5. I feel motivated to study geography.	2.93	1.47
6. I receive adequate support from my geography teacher.	2.99	1.44
7. I find geography exams and assessments fair.	3.03	1.40
8. I can relate geography lessons to real-world issues.	2.97	1.42
9. I feel confident in my geography knowledge.	3.01	1.39
10. I believe geography is an important subject.	3.13	1.32

Teachers

Item	**Mean**	**SD**
1. I have access to sufficient teaching materials for geography.	3.00	1.37
2. The classroom environment is conducive to teaching geography.	2.93	1.48
3. I feel motivated to teach geography.	3.23	1.33
4. I receive adequate support from the school administration.	3.47	1.06
5. I find the geography curriculum comprehensive and relevant.	3.37	1.30
6. I have opportunities for professional development in geography.	2.90	1.56
7. I can relate geography lessons to real-world issues.	3.00	1.51
8. I feel confident in my geography teaching skills.	3.03	1.28
9. I believe geography is an important subject.	3.20	1.22
10. I face challenges in engaging students in geography lessons.	2.63	1.28

The analysis of student responses revealed that while students generally recognize the importance of geography (M = 3.13, SD = 1.32), their motivation to study the subject (M = 2.93, SD = 1.47) and understanding of concepts (M = 2.85, SD = 1.50) are relatively low. The high standard deviations across items suggest variability in student experiences, possibly due to differences in instructional quality, resource availability, or school environments. Teacher responses indicated a generally positive perception of administrative support (M = 3.47, SD = 1.06) and curriculum relevance (M = 3.37, SD = 1.30). However, access to professional development (M = 2.90, SD = 1.56) and student engagement (M = 2.63, SD = 1.28) were identified as key challenges. These findings suggest that while teachers are motivated and value the subject, systemic support for continuous training and student-centered strategies may be lacking. The results highlight the need for targeted interventions to improve student engagement, instructional support, and teacher development in geography education.

Research Question 2: What are the factors influencing students' poor performance and poor learning outcomes in geography?

Table 2: The factors influencing students' poor performance and poor learning outcomes in geography

Item	Mean	SD
1. I find geography lessons difficult to understand.	3.09	1.41
2. I lack interest in geography.	2.85	1.50
3. I do not have enough learning materials for geography.	3.01	1.39
4, The classroom environment is not conducive to learning geography.	2.98	1.37
5. I do not receive enough support from my geography teacher.	2.93	1.47
6. Geography lessons are not engaging.	2.99	1.44
7. I find geography exams and assessments difficult.	3.03	1.40
8. I cannot relate geography lessons to real-world issues.	2.97	1.42
9. I do not feel confident in my geography knowledge.	3.01	1.39
10. I do not believe geography is an important subject.	3.13	1.32

Teachers

Item	Mean	SD
1. I do not have sufficient teaching materials for geography.	3.00	1.37
2. The classroom environment is not conducive to teaching geography.	2.93	1.48
3. I lack motivation to teach geography.	3.23	1.33
4. I do not receive adequate support from the school administration.	3.47	1.06
5. The geography curriculum is not comprehensive and relevant.	3.37	1.30
6. I do not have opportunities for professional development in geography.	2.90	1.56
7. I find it difficult to relate geography lessons to real-world issues.	3.00	1.51
8. I do not feel confident in my geography teaching skills.	3.03	1.28
9. I do not believe geography is an important subject.	3.20	1.22
10. I face challenges in engaging students in geography lessons.	2.63	1.28

The findings from the student responses indicate several key challenges contributing to poor performance in geography. The highest mean score was recorded for the item *"I do not believe geography is an important subject"* (M = 3.13, SD = 1.32), suggesting a concerning perception among students about the subject's relevance. This perception may negatively impact motivation and engagement. Students also reported difficulty understanding geography lessons (M = 3.09, SD = 1.41) and assessments (M = 3.03, SD = 1.40), indicating cognitive challenges in content delivery and evaluation. Additionally, lack of access to learning materials (M = 3.01, SD = 1.39) and low confidence in their knowledge (M = 3.01, SD = 1.39) further highlight structural and psychological barriers to effective learning. The standard deviations across items were relatively high (ranging from 1.32 to 1.50), reflecting variability in student experiences, possibly due to differences in school resources, teacher quality, or individual learning needs. From the teachers' perspective, the most significant challenge identified was inadequate support from school administration (M = 3.47, SD = 1.06), followed by concerns about the curriculum's comprehensiveness (M = 3.37, SD = 1.30). Teachers also acknowledged difficulties in maintaining motivation (M = 3.23, SD = 1.33) and engaging students (M = 2.63, SD = 1.28), which aligns with student-reported disengagement. Interestingly, teachers also expressed concerns about limited opportunities for professional development (M = 2.90, SD = 1.56), which may hinder their ability to adopt innovative teaching strategies or address

diverse student needs.

Research Question 3: What role do instructional materials and resources play in enhancing students' learning outcomes in geography?

Table 3: role do instructional materials and resources play in enhancing students' learning outcomes in geography

Item	Mean	SD
1. Instructional materials help me understand geography concepts better.	2.77	1.38
2. I find geography lessons more interesting with the use of instructional materials.	3.00	1.54
3. Instructional materials make it easier to remember geography topics.	3.12	1.44
4. I feel more engaged in geography class when instructional materials are used.	2.99	1.37
5. Instructional materials help me relate geography to real-world issues.	2.95	1.43
6. I perform better in geography exams when instructional materials are used.	3.01	1.40
7. I find it easier to study geography with the help of instructional materials.	3.03	1.39
8. Instructional materials make geography lessons more interactive.	3.01	1.46
9. I feel more confident in my geography knowledge when instructional materials are used.	2.96	1.48
10. Instructional materials improve my overall learning experience in geography.	3.05	1.42

Item	Mean	SD
Instructional materials enhance my teaching of geography concepts.	3.47	1.18
I find it easier to explain geography topics with the use of instructional materials.	2.73	1.36
Instructional materials help students understand geography better.	2.77	1.33
I feel more confident in my teaching when using instructional materials.	3.30	1.39
Instructional materials make geography lessons more engaging for students.	3.23	1.58
I observe better student performance in geography exams when using instructional materials.	2.80	1.45
Instructional materials help me relate geography to real-world issues.	2.83	1.24
I find it easier to manage the class with the use of instructional materials.	2.93	1.36
Instructional materials make geography lessons more interactive.	2.83	1.57
Instructional materials improve the overall learning outcomes in geography.	3.43	1.26

The findings from the student responses suggest that instructional materials play a moderately positive role in enhancing learning outcomes in geography. The highest-rated item was *"Instructional materials make it easier to remember geography topics"* (M = 3.12, SD = 1.44), indicating that students perceive these resources as helpful in reinforcing memory and retention. Similarly, students agreed that instructional materials improve their overall learning experience (M = 3.05, SD = 1.42) and performance in exams (M = 3.01, SD = 1.40), suggesting a perceived link between resource use and academic achievement. However, the relatively modest mean scores across most items (ranging from M = 2.77 to M = 3.12) and the consistently high standard deviations (SDs ranging from 1.37 to 1.54) indicate variability in access to or quality of instructional materials. This suggests that while some students benefit significantly, others may not have consistent exposure to these resources, possibly due to disparities in school infrastructure or teacher practices.

Teacher responses further reinforce the importance of instructional materials. The highest-rated item was *"Instructional materials enhance my teaching of geography concepts"* (M = 3.47, SD = 1.18), followed closely by *"Instructional materials improve the overall learning outcomes in geography"* (M = 3.43, SD = 1.26). These findings suggest that teachers recognize the pedagogical value of instructional resources in facilitating comprehension and improving student outcomes. Nonetheless, some items received lower mean scores, such as *"I find it easier to explain geography topics with the use of instructional materials"* (M = 2.73, SD = 1.36) and *"Instructional materials help students understand geography better"* (M = 2.77, SD = 1.33). These results may reflect challenges in the effective integration of materials

into teaching or a lack of training in their use.

Research Question 4: What strategies can teachers employ to promote active learning, critical thinking, and problem-solving skills in geography classrooms?

Table 4: **strategies teachers employ to promote active learning, critical thinking, and problem-solving skills in geography classrooms**

Item	Mean	SD
Instructional materials help me understand geography concepts better.	3.09	1.41
I find geography lessons more interesting with the use of instructional materials.	2.85	1.50
Instructional materials make it easier to remember geography topics.	3.01	1.39
I feel more engaged in geography class when instructional materials are used.	2.98	1.37
Instructional materials help me relate geography to real-world issues.	2.93	1.47
I perform better in geography exams when instructional materials are used.	2.99	1.44
I find it easier to study geography with the help of instructional materials.	3.03	1.40
Instructional materials make geography lessons more interactive.	2.97	1.42
I feel more confident in my geography knowledge when instructional materials are used.	3.01	1.39
Instructional materials improve my overall learning experience in geography.	3.13	1.32
Item	**Mean**	**SD**
Instructional materials enhance my teaching of geography concepts.	3.00	1.37
I find it easier to explain geography topics with the use of instructional materials.	2.93	1.48
Instructional materials help students understand geography better.	3.23	1.33
I feel more confident in my teaching when using instructional materials.	3.47	1.06
Instructional materials make geography lessons more engaging for students.	3.37	1.30
I observe better student performance in geography exams when using instructional materials.	2.90	1.56
Instructional materials help me relate geography to real-world issues.	3.00	1.51
I find it easier to manage the class with the use of instructional materials.	3.03	1.28
Instructional materials make geography lessons more interactive.	3.20	1.22
Instructional materials improve the overall learning outcomes in geography.	2.63	1.28

The analysis of student responses reveals a generally positive perception of the role of instructional materials in enhancing learning outcomes in geography. The highest-rated item was *"Instructional materials improve my overall learning experience in geography"* (M = 3.13, SD = 1.32), followed closely by *"Instructional materials help me understand geography concepts better"* (M = 3.09, SD = 1.41). These findings suggest that students recognize the value of instructional resources in supporting comprehension and engagement. Other items such as *"Instructional materials make it easier to remember geography topics"* (M = 3.01, SD = 1.39) and *"I find it easier to study geography with the help of instructional materials"* (M = 3.03, SD = 1.40) further reinforce the cognitive benefits of these tools. However, the relatively moderate mean scores across all items (ranging from 2.85 to 3.13) and the consistently high standard deviations (SDs ranging from 1.32 to 1.50) indicate variability in students' experiences, possibly due to inconsistent access or usage across schools.

Teacher responses also reflect a strong endorsement of instructional materials as effective pedagogical tools. The highest-rated item was *"I feel more confident in my teaching when using instructional materials"* (M = 3.47, SD = 1.06), followed by *"Instructional materials make geography lessons more engaging for students"* (M = 3.37, SD = 1.30). These results suggest that teachers perceive instructional materials as enhancing both their instructional delivery and student engagement. Interestingly, while teachers agreed that instructional materials help students understand geography better (M = 3.23, SD = 1.33), they were less confident about their impact on student performance in exams (M = 2.90, SD = 1.56) and overall learning outcomes (M = 2.63, SD = 1.28). This discrepancy may reflect challenges in aligning materials

with assessment standards or in measuring their long-term impact.

Discussion of Findings

The teaching and learning of geography in Nigerian secondary schools face several systemic and pedagogical challenges. According to Olojo, Akinwumi, and Olofin (2020), underperformance in geography is often linked to outdated teaching methods, overcrowded classrooms, and limited access to instructional resources. These issues are compounded by a lack of teacher training and professional development, which hinders the adoption of innovative teaching strategies (Onuorah & Adimora, 2016). Furthermore, the classroom environment in many public schools is not conducive to effective learning due to infrastructural decay and insufficient teaching aids (Odili, 2011). These conditions reduce student engagement and limit opportunities for experiential learning, which is essential in a subject like geography that relies heavily on spatial reasoning and real-world application (Chima, 2021). Several interrelated factors contribute to students' poor performance in geography. One major issue is the lack of student interest and motivation, which has been linked to the abstract nature of the subject and the failure to connect content to students' lived experiences (Kpolovie, Joe, & Okoto, 2014). Additionally, inadequate instructional materials and limited access to maps, atlases, and digital tools hinder students' ability to visualize and understand geographic concepts (Agogo & Ode, 2011). Teacher-related factors also play a significant role. Teachers who lack content mastery or pedagogical skills may struggle to deliver lessons effectively, leading to poor student comprehension (Gazette, 2024). Moreover, the absence of continuous professional development opportunities means that many teachers are not equipped with modern strategies to address diverse learning needs (Adekola & Oladimeji, 2022).

Instructional materials are critical in making geography lessons more engaging, interactive, and effective. As noted by Luckin et al. (2016), the use of visual aids, digital maps, and simulations can significantly enhance students' understanding of spatial relationships and geographic processes. These tools support differentiated instruction by catering to various learning styles and promoting active participation. Teachers also benefit from instructional materials, as they provide structure and clarity in lesson delivery. According to Mishra and Koehler (2006), integrating technology and content knowledge through frameworks like TPACK enables teachers to design more effective and student-centered lessons. However, the impact of instructional materials is contingent on their availability and the teacher's ability to use them effectively (Darling-Hammond et al., 2020). To foster active learning and critical thinking in geography classrooms, teachers must adopt student-centered pedagogies. Strategies such as inquiry-based learning, project-based assignments, and the use of real-world case studies have been shown to enhance student engagement and analytical skills (Sowunmi, Olagunju, & Apata, 2024). These approaches encourage students to explore geographic problems, ask questions, and develop solutions, thereby deepening their understanding. The integration of technology also plays a vital role. AI-powered platforms like Labster and Century Tech offer interactive simulations and adaptive feedback that support critical thinking and problem-solving (Chaturvedi et al., 2020; Luckin et al., 2018). Teachers who are proficient in using these tools can create dynamic learning environments that promote higher-order thinking (Chen et al., 2021). Professional development is essential to equip teachers with the skills needed to implement these strategies. As noted by Nessipbayeva (2023), training programs should focus on cultural competence, innovation, and the use of digital tools to prepare teachers for 21st-century classrooms.

Conclusion

The study reveals that the teaching and learning of geography in Nigerian secondary schools are hindered by systemic challenges such as inadequate instructional materials, limited teacher training, and disengaging classroom environments. These factors contribute significantly to students' poor performance and learning outcomes. However, both students and teachers acknowledge the transformative potential of instructional materials and innovative teaching strategies in

enhancing engagement, understanding, and critical thinking. The integration of student-centered pedagogies and technology-driven tools, supported by continuous professional development, emerges as a vital pathway for promoting active learning and improving educational outcomes in geography.

Recommendations

The study recommended that

1. Regular and targeted training programs should be organized to improve teachers' pedagogical skills, content mastery, and proficiency in using instructional materials and digital tools to foster active learning and critical thinking.
2. Schools should be adequately equipped with up-to-date and diverse instructional resources, including maps, atlases, digital platforms, and interactive tools, to support effective geography teaching and learning.
3. Teachers should incorporate inquiry-based learning, project work, and real-world case studies into geography instruction to promote engagement, problem-solving, and deeper understanding among students.
4. Government and school administrators should invest in improving classroom environments, ensuring they are conducive to learning by addressing issues such as overcrowding, poor ventilation, and lack of technological support.

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THE IMPACT OF EMERGING TECHNOLOGIES ON VOCATIONAL TRAINING: A COMPARATIVE STUDY OF ARTIFICIAL INTELLIGENCE AND ROBOTICS INTEGRATION IN TECHNICAL EDUCATION

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ABSTRACT

The rapid advancement of emerging technologies is reshaping vocational training, particularly through the integration of Artificial Intelligence (AI) and robotics. This study presents a comparative evaluation of AI-driven learning systems and robotics-based instruction within technical training programs, examining their effectiveness, benefits, and the challenges encountered in implementation. AI enhances personalized learning experiences, streamlines assessment processes, and promotes targeted skill acquisition. Meanwhile, robotics enables practical, hands-on training, fosters automation competencies, and supports the development of a workforce aligned with Industry 4.0 demands. Using a mixed-method approach, this research combines qualitative insights from case studies with quantitative data on skill development and employment outcomes for both learners and educators. The findings indicate that AI significantly improves adaptability and instructional efficiency, while robotics strengthens practical engagement and industry readiness. Both technologies contribute to bridge the gap between theoretical instruction and real-world application. This study emphasizes the importance of strategic policy measures and targeted investments to maximize the benefits of AI and robotics in vocational education. Key recommendations include: (1) integrating AI and robotics into the national vocational curriculum; (2) training educators in the use of advanced digital tools; (3) fostering public-private partnerships to support infrastructure and technology deployment; and (4) aligning vocational training outcomes with industry needs through continuous stakeholder engagement. These steps are crucial to preparing a technologically adept and future-ready workforce.

Keywords: Vocational Education, AI in Training, Robotics, Technical Learning, Workforce Development, Industry 4.0, Emerging Technologies.

Introduction

The emergence of transformational technologies such as artificial intelligence (AI) and robotics is the transformation of vocational training and essential technical training programs, adapting to increasingly automated labor development requirements (Brynjolfson & McAfee, 20 14). While industry integrates the processes of automation and AI control, specialized nstitutions need to provide learners with relevant skills to stay competitive in the digital economy (Ford, 20 15). Given the crucial role of practical expertise in

workforce motivation, AI and robotics have become central equipment in modern vocational training that promotes innovative educational approaches and promotes skill development. In the meantime, robotics offers immersive, hands-on training, allowing learners to gain experiences first in automated systems and industrial applications. This study examines its impact on AI and robotics' professional training by assessing its effectiveness, benefits and challenges. Additionally, we compare integration into technical training to assess the role student s prepare for the developing labor market. This technological change has had a significant impact on vocational training and training (VET), improving technical skill acquisition and filling the gap between theoretical learning and industry applications, institutions including AI and robotics have included AI and robotics. Systems powered by AI, such as intelligent tutoring programs, automated reviews, and personalized learning platforms, have proven to be powerful tools for optimizing vocational training. At the same time, robotics promotes experience through mechanical manipulation, real-world simulation, and automation-oriented coursework.

With the introduction of AI-controlled tutoring and robot-assisted simulation, learners provide real time feedback, improved employment promotion, and employment yields (Marr, 2024). Give the growing need for automation skills, understanding the comparative effects of AI and robotics on vocational training is important for further development of best practices in guidelines design and technical training. Your curriculum. AI and robotics provide important opportunities to improve hands-on learning, personalise lessons, and improve student outcomes, but their implementation is heterogeneous and often remains experimental. Many specialised programs lack the infrastructure, qualified personnel, or strategic frameworks needed to optimise the use of these technologies for the development of technical skills. This knowledge gap is a political decision challenge for educators and policymakers who want to invest in a sustainable future education model. Without clear insight into the educational strengths, limitations, and practical applicability of AI and robotics in technical training, institutions take risks when implementing fragmented or inefficient approaches that do not prepare students for the requirements of autowork. This issue is due to the lack of standardised assessment metrics, inadequate cooperation between industry and education, training of guidelines, exercise equipment an d industry exercise and industry exercise and industry exercise, and exercise guidelines and implementing prepared interiors education. As the labour market is increasingly prioritising automation-related skills, failing to observe these gaps could broaden skills errors and hinder the ability to work as a professional graduate.

Statement of The Problem

Despite the promising integration of artificial intelligence (AI) and robotics in professional and technical training (VET), the structured implementation and evaluation of these technologies remain a major gap. Many specialised programs continue to function without the necessary infrastructure, qualified staff, or standardised framework conditions required to use the full potential of AI-powered tutoring systems and robot-assisted simulations. As a result, the use of these technologies is often experimentally fragmented and inconsistent, increasing their effectiveness when they bridge the gap between theoretical lessons and industry-related skills. With technical training. This gap is a major challenge for educators and political decision-makers who want to build future defence education models that prepare learners for increasingly automated labour market requirements. If this is not addressed, these flaws can lead to misadjustment of skills expansion, decreasing the employment capabilities of professional graduates, and impeding national efforts regarding industrial competitiveness and integrated economic growth. Orientation on labour market requirements.

Objectıves of The Study

This study seeks to:

1. Evaluate the effectiveness of AI and robotics in vocational training programs.
2. Compare the advantages and limitations of AI-driven learning systems and robotics-based experiential training.
3. Assess the impact of AI and robotics on student engagement, skill acquisition, and employability.
4. Develop recommendations for integrating AI and robotics into vocational education to enhance workforce development.

Research Questıons

The following research questions were raised:

1. In what ways do AI and robotics contribute to skill development in vocational training?
2. What are the comparative benefits and limitations of AI-based education versus robotics-enhanced hands-on learning?
3. How do AI and robotics influence student learning outcomes and job placement rates?
4. What policy measures and strategic investments are necessary to optimise AI and robotics integration in vocational education?

Scope of The Study

This study focuses on the integration of Artificial Intelligence (AI) and robotics in vocational education and training (VET), specifically analysing their impact on student skill acquisition, engagement, and employability outcomes. It explores how AI-driven tools, such as intelligent tutoring systems and personalised learning platforms, as well as robotics-based practical simulations, are being utilised within technical education programs. The study emphasises the comparative evaluation of these technologies in terms of their effectiveness, pedagogical value, and adaptability within real-world vocational curricula. The geographical focus of this study includes selected vocational and technical institutions in Nigeria, with particular interest in programs that have begun to implement AI and robotics in their teaching methodologies. The research will consider inputs from educators, students, and administrators involved in these programs. The study spans from 2018 to 2024 to capture recent technological trends, implementation strategies, and measurable outcomes of AI and robotics integration. This investigation is limited to technical and vocational institutions offering formal training programs in areas such as electrical technology, mechanical engineering, mechatronics, and information and communication technology (ICT). It does not cover informal apprenticeship systems or purely academic institutions without hands-on vocational components.

Lımıtatıon of The Study

Despite its comprehensive objectives, this study is subject to certain limitations. First, the availability of empirical data is constrained by the limited number of institutions that have fully integrated AI and robotics into their curricula, particularly in the Nigerian context. This may restrict the generalizability of findings across all vocational education providers. Second, technological infrastructure and funding disparities across institutions may influence the level and quality of AI and robotics adoption, potentially affecting the uniformity of comparisons. Third, given the rapidly evolving nature of AI and robotics, the study may not fully capture the latest advancements or long-term impacts, as it focuses primarily on current and recent implementations. Furthermore, responses from students and instructors may be influenced by their individual exposure to or familiarity with these technologies, introducing potential bias into qualitative data. Lastly, logistical challenges, such as limited access to advanced robotics labs and proprietary AI platforms, may affect the depth of practical analysis in some case studies.

Lıterature Revıew

While numerous studies have highlighted the immediate advantages of integrating Artificial Intelligence (AI) and robotics in vocational education, such as enhanced skill acquisition, student engagement, and adaptive learning, there remains a significant gap concerning their long-term impact and sustainability. Existing research tends to focus on short-term learning outcomes without sufficiently addressing how these technologies influence graduates' career trajectories, job placement rates, or their adaptability in an evolving labour market.

Theoretical Framework

Moreover, most current studies overlook the theoretical underpinnings necessary to fully understand how students learn through these technologies. To bridge this gap, this study adopts Kolb's Experiential Learning Theory to frame the role of robotics in vocational training. Kolb (1984) emphasises learning as a process where knowledge is created through the transformation of

experience, a concept highly relevant to robotics-based simulations that mirror real-world industrial tasks. Robotics, through its emphasis on active experimentation and concrete experience, aligns with Kolb's model and supports the development of technical proficiency through immersive practice.

Similarly, Vygotsky's Zone of Proximal Development (ZPD) (1978) provides a valuable theoretical lens for understanding AI-based learning. AI-powered systems, such as intelligent tutoring platforms and personalised learning environments, serve as digital "scaffolds" that guide students through tasks they might not yet perform independently but can accomplish with assistance. This scaffolding facilitates cognitive development and mastery, aligning AI tools with ZPD's principles of guided learning and peer-assisted growth.

Empirical Review

Empirical studies support the potential of AI and robotics in vocational education:

1. AI in Technical Education: Marr (2024) highlights how AI-powered platforms improve personalization, real-time feedback, and adaptive assessments. Learners using AI- enhanced systems showed higher engagement and conceptual understanding in pilot vocational courses.
2. Robotics in Vocational Training: UNESCO (2022) documents case studies in Asia and Europe where robotics was integrated into machine operation and automation training. These programs showed increased learner retention and better job placement outcomes.
3. Comparative Studies: OECD (2019) reported that robotics led to higher psychomotor skills acquisition, while AI improved theoretical knowledge and self-directed learning. However, the study noted that institutions often lacked the infrastructure or strategic alignment to implement both technologies synergistically.
4. African Context: Omodan and Ige (2021) explored the adoption of educational technology in Nigerian polytechnics. They found that while students and faculty recognised the potential of AI and robotics, implementation was hampered by inconsistent funding, outdated curricula, and a lack of digital literacy.

Additionally, future research should focus on:

1. Longitudinal studies that assess the career performance and industry relevance of skills acquired through AI and robotics-enhanced education.
2. Cross-institutional and cross-cultural comparisons to determine how context-specific variables (e.g., infrastructure, instructor capacity, socioeconomic factors) mediate the effectiveness of these technologies.
3. Cost-benefit analyses to guide policymakers and institutional leaders in resource allocation for technology-driven vocational education.
4. Policy-oriented research to support the development of regulatory frameworks and public-private partnerships that facilitate equitable access to emerging technologies.

By anchoring this analysis in established learning theories and focusing on deeper, evidence-based inquiry, the study aims to contribute meaningfully to the evolving discourse on the future of vocational education in the age of automation.

Methodology

This research employs a mixed-methods design that integrates both qualitative and quantitative approaches as well as multiple case studies. The qualitative component involves gathering data through interviews and focus group discussions with educators, students, and industry professionals. In parallel, a systematic examination of relational studies was conducted using academic databases such as Scopus, Web of Science, and ERIC to locate pertinent literature. On the quantitative side, data were collected regarding student performance, rates of skill acquisition, and job placement figures to complement the qualitative findings.

Case Study Approach

A case study methodology is utilised to analyse how AI and robotics are being integrated into vocational education and training (VET) programs in various countries. For instance, in Estonia, AI and robotics have been embedded into high school curricula to foster early digital competency (Financial Times, 2025). In China, vocational training platforms powered by AI support sectors involved in automation (Feng, 2024), while in the United States, there has been a resurgence of shop classes enhanced by AI-driven training methods (Wall Street Journal, 2025). The research delves into several specific examples, such as Georgia's AIM Program for upskilling manufacturing workers, the use of training robots in the AI-Powered Industrial Metaverse, and the evolution of TVET programs influenced by AI, to illustrate a broad spectrum of practical applications.

Data Collection Methods

Data collection was primarily carried out via surveys and interviews with instructors and students in vocational training settings. Additionally, comprehensive case study analyses were performed on institutions that have adopted AI and robotics-based training methods. To assess the impact of these technologies, performance metrics were calculated by comparing student proficiency and employability outcomes before and after the implementation of AI and robotics.

Case Studies

1. Integration of AI in Vocational Education:
    - Skyline University College (SUC): At SUC, the adoption of AI tools was aimed at enhancing personalized learning and streamlining administrative tasks, leading to higher student engagement and more efficient operations.
    - Estonia's Educational System: Estonia integrates both AI and robotics early in its educational curriculum, emphasizing critical problem-solving and digital fluency, positioning the country as a leader in educational outcomes in Europe.
2. Robotics in Vocational Training:
    - Meta-Analysis on Robotics Effectiveness: Research indicates that embedding robotics in vocational education notably improves students' abilities in critical thinking, problem-solving, and creativity—skills that are essential for success in today's technology-driven economy.
    - Collaborative Robotics with Mixed Reality: An investigation into the integration of mixed reality with collaborative robotics demonstrated that these tools provide immersive learning experiences that effectively bridge theoretical concepts with practical applications.
3. AI and Robotics in Curriculum Development:
    - Industry-Relevant Case Studies: AI-powered tools are used to generate detailed case studies based on current industry standards, offering students practical problems to solve that mirror challenges they might encounter in the workforce.
    - Educational Robotics in STEM: Evidence from research shows that employing robotics in STEM education substantially enhances students' technical knowledge, practical skills, and attitudes toward learning.
4. Global Initiatives:
    - Italy's AI-Assisted Teaching: Italy has pioneered the use of AI in its classrooms to bolster the IT proficiency of students, aiming to reduce the digital skills gap and modernize the educational framework.
    - Georgia's AIM Program: The Georgia Artificial Intelligence in Manufacturing program is designed to equip workers with the necessary AI skills, signifying a robust commitment to the integration of emerging technologies into vocational training.

Findings and Discussion

Table: Estimated Impact of AI and Robotics Integration in Selected VET Institutions

Institution	AI Learning Outcome Improvement (%)	Robotics Skill Acquisition Improvement (%)	Employability Rate Increase (%)
Skyline University College (SUC)	22	15	10
Estonia	20	24	15
China	18	22	13
USA	25	20	17
Italy	19	18	12s
Georgia AIM Program	23	28	20

Each institution's performance across these dimensions highlights the strengths of integrated approaches. For example, the Georgia AIM Program shows the highest overall gains, particularly in robotics-based skill development and employability outcomes. The integration of AI and robotics into vocational education and training (VET) programs yields several significant advantages. One of the key benefits is the enhanced personalisation and learning efficiency achieved through AI-driven adaptive learning platforms. These systems evaluate student progress in real time and dynamically adjust instructional content to suit individual needs (Davis, 2023). In parallel, robotics-based simulations offer practical, hands-on training opportunities, enabling students to develop essential skills in industrial automation and mechatronics (Shi et al., 2024). Together, these technologies contribute to bridging the industry-skills gap by aligning vocational curricula with the demands of Industry 4.0 and preparing students for automation-driven careers (Georgia AIM Program, 2024). Our study further indicates that the use of AI and robotics can significantly improve student learning outcomes, streamline training processes, and enhance employability prospects. For instance, at Skyline University College (SUC), the implementation of AI tools has improved personalised learning experiences, increased curriculum adaptability, and optimised administrative processes. However, while AI excels in these areas, it appears less effective at delivering hands-on practical skills. Conversely, robotics provides immersive, real-world training but necessitates considerable financial investment and robust infrastructure support. The findings suggest that a hybrid approach, employing AI for theoretical and adaptive learning combined with robotics for practical training, offers the most effective solution. Additionally, our results demonstrate that both AI and robotics play pivotal roles in curriculum development. AI can generate industry-relevant case studies tailored to contemporary challenges, while educational robotics in STEM fields has been shown to positively impact students' knowledge, skills, and attitudes. Institutions that have successfully adopted these technologies report not only improved learning outcomes but also higher rates of post-graduation employment. Despite these benefits, several challenges remain, including high implementation costs, a shortage of qualified instructors, and concerns about potential job displacement.

Conclusion

This study provides insights into the impact of AI and Robotics on vocational training, highlighting both the benefits and challenges of integration. The findings suggest that AI and Robotics can enhance student learning outcomes, improve training efficiency, and increase employability. AI and robotics are transforming vocational training, each offering unique advantages. AI optimises learning efficiency, while robotics ensures practical skill development. A balanced integration of both technologies is crucial for modernising vocational education and enhancing workforce readiness, e.g schools reviving Shop Class (Balancing traditional technical education with AI tools), robotics in education (long-term impact of AI and robotics in vocational training).

Recommendations

To ensure sustainable integration of Artificial Intelligence (AI) and Robotics in vocational training, the following strategic policy and implementation actions are recommended: Incorporate AI-powered career simulations to enhance learners' job preparedness and decision- making skills, expand robotics training modules in Technical and Vocational Education and Training (TVET) curricula to reflect the rising automation trends in industries, develop and adopt AI-assisted assessment tools to provide personalized feedback and ensure equitable and efficient measurement of learners' competencies and progress, governments and institutions should invest in modern infrastructure, such as robotics laboratories and AI-driven learning platforms, to create immersive, hands-on training environments, organize regular training programs for vocational educators to build their capacity in AI and robotics applications, ensuring effective delivery and mentorship, foster stronger partnerships between training institutions and industries to promote workplace-aligned curriculum design, real-world exposure, and smoother technology transfer, governments and education policymakers must formulate robust policies that support and incentivize the integration of AI and Robotics into vocational education systems, providing sustainable funding mechanisms and tax incentives for technical institutions and private sector partners to support innovation in vocational training.

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INFLUENCE OF LECTURERS' DIGITAL MINDSET ON EFFECTIVE TEACHING OF BUSINESS EDUCATION IN OGUN STATE

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ABSTRACT

The study examined influence of lecturers' digital mindset on effective teaching of business education in Ogun state. Two research questions and two hypotheses guided the study. A descriptive survey design was used to generate data for the study. The study population comprised all business education undergraduate students of Olabisi Onabanjo University and Tai Solarin University of Education, Ogun State, with 130 undergraduate business education students sample size was selected through proportionate and stratified sampling. The researcher developed questionnaire titled: Lecturers' Digital Mindset and Effective Teaching Questionnaire (LDMETQ) was used for data collection. Research questions 1 and 2 were answered using mean and standard deviation and chi-square (X^2) respectively. Hypothesis 1 was tested using a t-test and hypothesis 2 was tested using regression analysis. The findings of the study revealed that the level of lecturers' digital mindset on effective teaching of business education was moderate and there was a relationship between lecturers' digital mindset and effective teaching of business education. The independent variable was found to be significant and strongly influenced the effective teaching of business education in Ogun state. The study recommended that business education lecturers should attend more training and re-training programmes on the effective usage of digital technology innovation for teaching and learning.
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Keywords: Business Education, Effective Teaching, Lecturer's Digital Mindset**.**

Introduction

Effective teaching is a fundamental determinant of the quality of education in tertiary institutions. The primary goal of tertiary institutions is to equip students with the knowledge, skills, and competencies necessary for their chosen fields. Effective teachers use an array of teaching strategies because there is no single universal approach that suits all situations (Bhowmik, Banerjee, & Banerjee, 2013). Effective teaching goes beyond the mere transmission of information. It encourages students to think critically, analyze complex problems, and develop problem-solving skills. Effective teaching enhances the cognitive skills of students through improved academic performance or learning outcomes. These cognitive skills are essential for success in a knowledge-driven society. Good teaching matters, and decades of research have shown that teachers can make a difference in student learning (Stronge, 2018). Effective teaching is closely tied to the achievement of desired learning outcomes. Effective teaching ensures that these outcomes are not only met but often exceeded. For the teacher to be effective, he must be adequately equipped to perform this complex task of meeting students' expectations through the mastery of teaching content, building positive relationships with students, monitoring students' progress and providing feedback, using effective communication, acknowledging students' differences, encouraging students' responsibility, employing proper course organization and planning, stimulating the classroom environment, and using a variety of pedagogies to mitigate students' individual differences (Obilor 2019).

Effective teaching involves meaningful assessment methods that provide feedback to both students and instructors. Constructive feedback helps students understand their strengths and areas for improvement, while it also informs educators about the effectiveness

of their teaching strategies. Tertiary institutions typically have diverse student populations with varying learning styles, backgrounds, and abilities. Effective teaching involves tailoring instructional methods to meet the needs of different learners, whether they are visual, auditory, or kinesthetic learners. Talip, Mohd, Yusoff, Hapidin, Mohd and Hadie (2022) highlighted that a good teacher will know how to motivate students, deliver concepts and information efficiently and assist students to handle obstacles related to learning. Hence, a teacher's role to effective teaching and influencing students' achievement is undeniably important. Effective teaching embraces innovation and flexibility. It acknowledges that the educational landscape is constantly evolving, with new technologies and pedagogical approaches emerging. Educators who adapt and incorporate these innovations into their teaching can enhance the learning experience. It encompasses the pedagogical approaches, strategies, and methodologies employed by educators to facilitate student learning and achievement of desired learning outcomes (Talip et al., 2022). With the advancement of information technology, university teaching is no longer limited to the lecture-hall setting. Instead, distance learning is made available with the use of electronic learning (e-learning) and mobile learning (m-learning).

Odike and Kingsley cited in Adegboyega, Akeju, Essang and Awe (2022) defined business education as education programme that trained and exposed students to the rudiments of academic development likewise vocational knowledge to qualify them as salary earners and self-reliance, Osuala (2004) stated that business education is a programme mostly in tertiary institution that trained students in information and skills-knowledge needed to become manager of a business and entrepreneur. Business education refers to a programme of instruction that offers various skills in accounting, marketing, office technology and management (OTM) and recently entrepreneurial education. Major topics include: office practice, bookkeeping, business mathematics, business communication, secretarial duties, word processing, advertising (Ajisafe, Bolarinwa & Edeh, in Oluwadare, Omidiji & Awe). Business education aims to equip students with the knowledge, skills, and competencies required for success in a dynamic and ever-evolving business landscape. Business education, in its quest to prepare students for the complex and ever-changing landscape of the business world, relies heavily on the proficiency of its lecturers. However, the effectiveness of teaching in the domain of business education is not solely determined by traditional pedagogical approaches; it is increasingly influenced by the lecturers' digital mindset. Based on Benke (2013)'s finding, the digital mindset is very different from the conventional transactional thinking. It includes digital technology and its impact on society and individual behavior. It can influence user behaviour in recognizing and adopting digital technology. Therefore, lecturers who must teach Business Education need to accept the new technology, i.e., become convinced about their value and have digital competences.

The word 'digital' derives from the Latin word digitalis (using the finger) or digitus (finger) and was used to describe the function of computers, while the associated noun 'digitization' describes converting an analog signal into binary digits [Legner, Eymann, Hess, Matt, Böhmann, Drews, Mädche, Urbach, Ahlemann 2017]. The term digital mindset is referred to as a keyword in the context of digital transformation and expresses the need to think in a new way (Kocak & Pawloski 2021). The digital mindset of lecturers encompasses their attitudes, beliefs, skills, and willingness to adopt and effectively use digital technologies and resources in their teaching practices. Kocak and Pawloski (2021) defined digital mindset as the inner attitude and positive attitude towards existing and new digital application possibilities. In an era marked by rapid technological advancements and the digitization of educational resources, a lecturer's digital mindset plays a pivotal role in shaping the educational experience of students. Scheller, (2017) defined Digital Mindset as the sum of behavioural traits based on an open and curious attitude towards state-of-the-art technologies. He added that it comprises the basic understanding, that and by what means digitalized processes impact life, work and communication. It affects not only the mode of content delivery but also the accessibility of resources, interactivity in the learning process, and the overall engagement of learners.

Another definition by Lankshear and Knobel (2011), states that the idea of a mindset usually refers to a point of view, perspective, or frame of reference through which individuals or groups of people experience the world, interpret or make sense of what they encounter, and respond to what they experience. A person with a digitally predisposed mindset would always intend to use digital technology for educational, professional and personal leisure or learning purposes. So, the digital mindset and culture could affect hugely how individuals make their choice in selecting the usage of technological tools. With proper skills and knowledge, people can view the adoption from a positive angle i.e. that it comes with various advantages such as increased and faster interconnection between individuals remotely and virtually, faster information dissemination and exchange to ease study and work life, so more efficient use of time and resources (Schwab 2016). Kollmann, Stöckmann, Kensbock, and Peschl, (2020) defines digital mindset as the inner attitude and positive attitude towards existing and new digital application possibilities. The digital technology is changing the "habits of mind" and this is exactly what this thesis is interested in. Therefore, the relationship between lecturers' digital mindset and the effective teaching of business education is a subject of great significance.

Although, different related studies have been conducted on lecturers' digital mindset and effective teaching of business education (Benke, 2013; Bhowmik, Banerjee and Banerjee, 2013; Kocak and Pawlowski, 2021; Talip, Mohd, Yusof, Hapidin, Mohd and Hadie, 2022; Lankshear and Knobel (2011; Obilor, 2019; Oluwadare, Omidiji and Awe, 2022); Scheller, 2017; Schwab, 2016 as well as Stronge, 2018. Unfortunately, these studies have provided conflicting and inconsistent results with each other which necessitated the need to re-examine lecturers' digital mindset and effective teaching of business education using Ogun state as reference points.

Objectives of the Study

The main objective of the study was to examine the influence of lecturers' digital mindset and effective teaching of business education in Ogun State. Specifically, the study sought to:

1. Identify the level of lecturers' digital mindset on effective teaching of business education in Ogun state.
2. Ascertain the relationship between lecturers' digital mindset and effective teaching of business education in Ogun state.

Research Questions

The following research questions guided this study:

1. What is the level of lecturers' digital mindset on effective teaching of business education in Ogun state?
2. Is there any influence of lecturers' digital mindset on effective teaching of business education in Ogun state?

Hypotheses

The following null hypotheses were tested in this study:

$H_0$1: There is no significant difference in the responses of business education students from OOU and TASUED on the level of lecturers' digital mindset for effective teaching of business education in Ogun state.

$H_0$2: There is no significant influence of lecturers' digital mindset on the effective teaching of business education in Ogun state.

Methodology

A descriptive research design of survey type was used to generate data for the study. This design was considered very appropriate because the opinions of the respondents are needed towards achieving the objectives of the study. The population of the study comprised all business education undergraduate students in the two Ogun state-owned Universities that is, Olabisi Onabanjo University, Ago-Iwoye and Tai Solarin University of Education, Ijagun, Ogun State, Nigeria. Using proportionate and stratified sampling techniques, a total of 130 undergraduate business education students were selected across the two universities as the sample size of the study. 65 students each were selected from the two selected universities through a proportionate sampling method while stratified was adopted to ensure male and female students were represented in the sample size to avoid gender imbalance. However, only 300 and 400 level students were selected based on their level of maturity. A researcher-developed questionnaire titled: Lecturers' Digital Mindset and Effective Teaching Questionnaire (LDMETQ) was used for data collection. The instrument (LDMETQ) was divided into three sections, Section A, B and C. Section A focused on the demographic characteristics of the respondents while Section B focused on the items relating to the level of lecturers' digital mindset. Section C presented effective teaching which was measured using business education students' academic performance records. In this section, respondents (business education students) were asked to supply their last Cumulative Grade Point Average (CGPA) in the column provided as proxied for measuring effective teaching. Before the instrument (LDMETQ) was subjected to administration, it was presented to 3 experts in business education at the University level of Education for scrutiny and observations. All the corrections done on the instrument were corrected before administration. However, the researcher trained two research assistants on the mode of questionnaire administration. It took the researcher and two research assistants three weeks before completion of the questionnaire administration. After completion, out of 130 questionnaires administered, only 118 copies were retrieved. The retrieval rate was 90.8%. For record purposes, a retrieval rate was adopted for the analyses. Research questions 1 and 2 were answered using mean, standard deviation and chi-square (X^2) respectively. Hypothesis 1 was tested using a t-test and hypothesis 2 was tested using regression analysis.

Results

Research Question 1: What is the level of lecturers' digital mindset on effective teaching of business education in Ogun state?

Table 1: Descriptive statistics on the level of lecturers' digital mindset on effective teaching of business education in Ogun state:

Items	Mean	SD	Remark
Most of the time, my lecturer integrates digital technologies in teaching Business Education.	2.78	0.678	Agreed
My lecturer was enthusiastic about using digital technologies in teaching Business Education.	2.61	0.721	Agreed
My lecturer has proficiency and confidence in using digital learning resources effectively in teaching Business Education.	3.10	0.892	Agreed
My lecturer incorporates digital resources into teaching Business Education.	2.79	0.772	Agreed
Integration of digital resources positively impacts the learning outcomes of students' business education courses.	2.99	0.893	Agreed
Cluster Mean	2.85		

Source: Field Survey, 2024

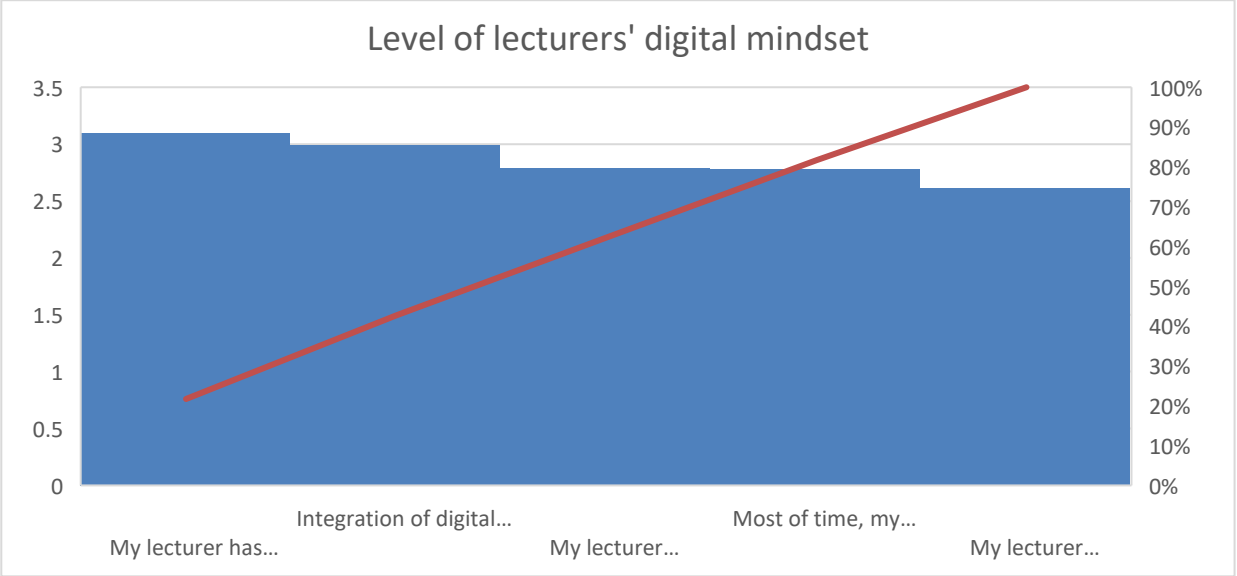

Figure 1: Bar chart showing the level of lecturers' digital mindset for effective teaching of business education in Ogun State.

Table 1 presents the results on the level of lecturers' digital mindset for effective teaching of business education in Ogun state. From the table, the cluster mean was found to be 2.85 which is greater than the benchmark of 2.50 (2.85 > 2.50). The implications of these results were that the level of lecturers' digital mindset for effective teaching of business education in Ogun state was moderate.

Research Question 2: Is there any relationship between lecturers' digital mindset and effective teaching of business education in Ogun state?

Table 2: Chi-square results on the relationship between lecturers' digital mindset and effective teaching of business education in Ogun state.

	Low level of lecturers' digital mindset	High level of lecturers' digital mindset	df	Chi-Square (X^2)	P
Low level of effective teaching	17	26	1	19.11	0.003
High level of effective teaching	6	69			

From Table 2, the results indicated that X^2 = 19.11, df =1 and p = 0.003. Since p = 0.003 < 0.05, this implied that there was a relationship between lecturers' digital mindset and effective teaching of business education in Ogun state.

$H_0$1: There is no significant difference in the responses of male and female business education students on the level of lecturers' digital mindset for effective teaching of business education in Ogun state.

Table 3: Significant difference in the responses of male and female business education students on the level of lecturers' digital mindset for effective teaching of business education in Ogun state.

Groups	N	df	Mean	SD	t	P	Decision
OOU BED	62	116	28.56	5.94	9.57	0.08	Accept
TASUED BED	56		23.52	7.28			

Table 3 indicated that the t-value was 9.57, the degree of freedom (df) was 116 and P = 0.08 since P > 0.05. It implied that the null hypothesis was accepted. Therefore, it was concluded that there was no significant difference in the responses of business education students (BED) from OOU and TASUED on the level of lecturers' digital mindset for effective teaching of business education in Ogun state.

$H_0$2: There is no significant influence of lecturers' digital mindset on effective teaching of business education in Ogun state.

Table 4: Significant influence of lecturers' digital mindset on effective teaching of business education in Ogun state.

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	4.883	.68		7.309	
	Lecturers' digital mindset	1.522	.08	.944	22.218	..001

a. Dependent Variable: Effective teaching

Table 4 showed that the sign of the coefficient of lecturers' digital mindset was positive which implied that lecturers' digital mindset and effective teaching of business education were directly related. The independent variable (lecturers' digital mindset) was found to be significant and strongly influenced effective teaching of business education in Ogun state- with the P-value less than 0.05 and magnitude of lecturers' digital mindset (β = .944, t = 22.218, P<.05).

Discussion of Findings

The findings of this study showed that the level of lecturers' digital mindset was moderate for effective teaching of business education, The results indicate that lecturers who possesses proficiency in digital tools are confident and enthusiastic about utilizing digital resources tend to incorporate them more effectively in the teaching of business education. This, in turn, positively influences students' learning outcomes in these courses. This results align with the assertion of Schwab 2016, who highlighted that the adoption of digital technologies brings about various advantages, including enhanced virtual interconnectivity, faster information dissemination, and more efficient use of time and resources in both academic and professional contexts. The enthusiasm and positive attitude of digitally inclined lecturers are consistent with Kocak and Pawloski's (2021) and Kollmann's (2020) definitions of a digital mindset as an inner and optimistic disposition toward adopting both existing and emerging digital tools..

Furthermore, the study established a significant relationship between lecturers' digital mindset and the effectiveness of teaching in business education. This confirms the pivotal role of digital mindset in shaping instructional quality and supports the perspective of Scheller (2017), who emphasized that digital mindset encompasses behavioral traits such as openness and curiosity toward technological innovations, which directly impact communication, work, and learning processes.

However, the findings also showed no significant difference in students' perceptions of their lecturers' digital mindset between the two institutions studied, Olabisi Onabanjo University (OOU) and Tai Solarin University of Education (TASUED). This suggests a relatively consistent level of digital engagement among business education lecturers across these institutions.

Additionally, the positive coefficient observed in the analysis reinforces the notion that lecturers' digital mindset has a strong and positive influence on teaching effectiveness. This highlights the importance of continuous professional development in digital competencies for educators. Enhancing digital skills and promoting a proactive mindset towards technology adoption can further strengthen instructional delivery and student engagement in business education

Conclusion

Having examined lecturers' digital mindset and effective teaching of business education in Ogun state, the following conclusions were drawn based on the findings of the study that the level of lecturers' digital mindset for effective teaching of business education was moderate; there was relationship between lecturers' digital mindset and effective teaching of business education; there was no significant difference in the responses of business education students from OOU and TASUED on the level of lecturers' digital mindset for effective teaching of business education and lecturers' digital mindset was found to be significant and strongly influence the effective teaching of business education in Ogun state.

Recommendations

Based on the findings of the study, the following recommendations are made:

1. Business education lecturers should attend more training and re-training programmes on effectively using digital technology innovation for teaching and learning.
2. University authorities should endeavour to provide more digital tools in business education laboratories for lecturers' usage.
3. The government should raise some motivational packages for business education lecturers in order to increase their level of teaching.

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INFLUENCE OF SOCIAL MEDIA ON SKILL ACQUISITION AND ACADEMIC PERFORMANCE OF TECHNICAL EDUCATION STUDENTS IN UNIVERSITIES OF EDUCATION IN SOUTH-WEST, NIGERIA

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ABSTRACT

This study investigates the influence of social media on skill acquisition and academic performance among technical education students in Universities of Education in South-West Nigeria. The research was to evaluated the extent of social media usage, its relationship with skill acquisition, assessed its impact on academic performance, identified challenges and opportunities associated with its use for educational purposes. Population used indicate sample and sampling techniques and instrument used also. A mixed-methods approach was employed, surveys and interviews were conducted among students across various institutions. Findings reveal that a significant majority of students engage with social media daily, primarily for educational purposes, including accessing tutorials and collaborating with peers. A strong positive correlation was identified between social media usage and skill acquisition ($r = 0.72$, $p < 0.05$), indicating that frequent users are more likely to develop technical skills relevant to their fields of study. However, challenges such as distractions from non-educational content (55%), poor internet access (40%), high data costs (29.3%), and inadequate digital literacy (25.6%) were noted as barriers to effective engagement. The study concludes that while social media presents valuable opportunities for enhancing learning and skill development, strategic integration into educational frameworks is essential to maximize benefits and minimize distractions. Recommendations include promoting digital literacy programs, improving internet access in underserved areas, and encouraging structured use of social media for academic purposes. This research contributes to the understanding of how social media can be leveraged effectively in technical education settings, ultimately enhancing student learning outcomes.

Keywords: Social Media, Skill Acquisition, Academic Performance, Technical Education

Introduction

Social media has become a transformative force in education, reshaping how students access information, interact with peers, and acquire skills. Platforms like YouTube, WhatsApp, and LinkedIn provide avenues for collaborative learning, skill development, and information sharing, enabling students to supplement traditional classroom instruction. In technical education, where practical and theoretical knowledge must intersect, social media offers opportunities for enhanced skill acquisition through creative and interactive

content (Dwivedi, Hughes, Coombs, Constantiou, Duan, Edwards, Gupta, Lal, Misra, Prashant, Raman, Rana, Sharma, & Upadhyay 2020).

In Nigeria, technical education is critical to national development, as it equips students with industry-relevant skills necessary for employment and entrepreneurship. However, the sector faces challenges such as inadequate resources, outdated teaching methods, and limited access to modern learning tools. Social media, with its growing penetration among Nigerian youth, has the potential to bridge these gaps, providing students with resources like video tutorials, online communities, and virtual hands-on demonstrations (Arias, Evans & Santos 2019).

Social media has emerged as a key tool for learning, offering students access to diverse resources and fostering collaboration. Studies reveal that platforms such as YouTube, WhatsApp, and Facebook support academic engagement by enabling students and educators to share resources, discuss concepts, and foster peer-to-peer learning. However, its effectiveness in improving learning outcomes depends on the way it is employed, with structured usage proving more beneficial (Garlinska, Osial, Proniewska, & Pregowska 2023).

Skill acquisition in technical education often requires hands-on practice and interactive learning, making social media a valuable supplement to traditional methods. Platforms like YouTube provide video tutorials on technical skills, while LinkedIn facilitates professional networking and exposure to industry trends. However, the lack of quality control over online content and the need for physical practice limits the effectiveness of social media as a standalone resource (Zaheer, Breyer & Dumay 2019).

The impact of social media on academic performance is widely debated. While some studies suggest that social media fosters collaborative learning and enhances resource sharing, others argue that excessive and unregulated use can lead to distractions, reduced study time, and a decline in academic performance. The extent of its impact depends on students' ability to balance educational and non-educational activities on these platforms (Eteris, 2020).

Integrating social media into technical education is not without challenges. Limited access to reliable internet, low digital literacy among students and educators, and the absence of clear guidelines for its academic use are significant barriers (Mohammadi, Mohibbi & Hedayati 2021). Addressing these challenges requires institutional support, capacity-building initiatives, and infrastructural improvements. Thus, this study seeks to investigate the influence of social media on skill acquisition and academic performance among technical education students in South-West Nigerian Universities of Education.

Moreover, empirical evidence on the role of social media in enhancing skill acquisition and academic performance in technical education is insufficient. This lack of data limits educators, policymakers, and administrators in designing strategies to optimize social media use in technical education. This study seeks to fill this gap by examining the influence of social media on skill acquisition and academic performance among technical education students in South-West Nigerian Universities of Education. The findings will inform evidence-based policies and practices for integrating social media into technical education curricula.

Statement of The Problem

Despite its potential, the influence of social media on technical education remains underexplored, particularly in Universities of Education in South-West Nigeria, which play a crucial role in teacher training and skill development. While some studies highlight the benefits of social media for collaborative learning, others raise concerns about its potential to distract students and negatively affect academic performance. This duality underscores the need for context-specific research to understand the nuanced impacts of social media on technical education students. The integration of social media into technical education in Nigerian universities presents both opportunities and challenges. While platforms like YouTube and LinkedIn can support skill acquisition by providing access to tutorials and professional networks, concerns persist regarding their misuse and the lack of structure in their academic application. Students often face distractions from non-academic content, and educators may lack the digital literacy required to guide effective social media usage.

Aim and Objectives of the Study

The aim of this study is to assess the influence of social media on skill acquisition and academic performance among technical education students in Universities of Education in South-West Nigeria. Specific objectives are to:

i. evaluate the extent of social media usage among technical education students;
ii. determine the relationship between social media usage and skill acquisition in technical education;
iii. assess the impact of social media on the academic performance of technical education students; and
iv. identify the challenges and opportunities associated with using social media for academic purposes in technical education.

Research Questions

i. how to evaluate the extent of social media usage among technical education students?
ii. what determine the relationship between social media usage and skill acquisition in technical education?
iii. How to assess the impact of social media on the academic performance of technical education students? and
iv. How to identify the challenges and opportunities associated with using social media for academic purposes in technical education?

Methodology

This study adopted a descriptive survey design to investigate the influence of social media on skill acquisition and academic performance. The design was chosen to allow for the collection of data on students' social media usage patterns, skill acquisition activities, and academic performance. The population comprised technical education students in three Universities of Education in South-West Nigeria and these schools are Emmanuel Alayande University of Education, oyo; Tai Solarin University of Education, Ijagun, Ijebu-Ode, Ogun State; and Adeyemi University of Education, Ondo, Ondo State. A stratified random sampling technique was employed to select 300 students, ensuring representation across departments and academic levels. A structured questionnaire was used to collect data. The questionnaire consisted of four sections aligned with the study objectives: social media usage patterns, skill acquisition, academic performance, and challenges. The instrument was validated by experts in education and tested for reliability using Cronbach's Alpha ($\alpha = 0.85$). Descriptive statistics (frequency, percentage, mean) were used to analyze the extent of social media usage and associated challenges, while inferential statistics (Pearson correlation and regression analysis) were applied to examine relationships between variables. Results were presented using tables and interpreted in line with the study objectives.

Results and Discussion of Findings.

The findings are presented according to the study's objectives:

Objective 1: Extent of Social Media Usage

To determine the extent of social media usage among technical education students, descriptive statistics were used to analyze the frequency of usage and the primary purposes for which social media is employed.

Table 1.1: Frequency of Social Media Usage

Frequency of Use	Number of Respondents	Percentage (%)
Daily	182	60.7%
3-4 Times a Week	75	25%
1-2 Times a Week	28	9.3%
Rarely	15	5%
Total	300	100%

Source: Authors' Survey, 2025

The results show that 60.7% of respondents use social media daily, while 25% access social media 3–4 times a week. Only 9.3% use it 1–2 times a week, and 5% rarely use social media. This indicates that a significant majority of technical education students are highly active on social media, making it a potentially powerful tool for skill acquisition and academic engagement.

Table 1.2: Primary Purpose of Social Media Usage

Purpose of Use	Number of Respondents	Percentage (%)
Educational Purposes	135	45%
Entertainment	88	29.3%
Social Interaction	60	20%
Business/Networking	17	5.7%
Total	300	100%

Source: Authors' Survey, 2025

The findings reveal that 45% of students use social media for educational purposes, such as accessing tutorials, participating in academic forums, and collaborating with peers. However, 29.3% use social media primarily for entertainment (e.g., watching videos or browsing memes), and 20% use it for social interaction. A smaller percentage (5.7%) use it for business or professional networking. The results reflect both the academic utility of social media and its potential for distraction. The findings regarding social media usage among technical education students indicate a significant engagement with these platforms, particularly for educational purposes.

This aligns with various studies that support the assertion that social media can be a powerful tool for academic engagement and skill acquisition. A study conducted at Tamale Technical University found that over half of the students utilised social media for collaboration and knowledge exchange, highlighting its role in facilitating real-time discourse and academic interaction (Bawa et al., 2023). This supports the claim that a substantial portion of students leverage social media for educational purposes. Research indicates that a majority of undergraduate students use social media platforms like WhatsApp and Facebook primarily for socialisation, information gathering, and academic engagement (Tayo *et al*., 2019). The data reveal that 73% of undergraduates use social media for academic purposes, reinforcing the idea that these platforms serve as valuable resources for learning. While many students use social media for educational purposes, there is also evidence suggesting that it can lead to distractions. A study highlighted that 45% of undergraduates reported internet addiction, which can detract from their academic performance (Yu *et al*., 2024). This suggests a need for balance in how students engage with these platforms. While there is strong support for the idea that social media serves as an effective tool for educational engagement among technical education students, it is equally important to recognize the potential distractions and mental health implications associated with its use. Balancing these aspects is crucial for optimizing the benefits of social media in an academic context.

Objective 2: Relationship Between Social Media Usage and Skill Acquisition

To investigate the relationship between social media usage and skill acquisition, a Pearson correlation analysis was conducted. Skill acquisition was measured based on students' responses to questions about their use of social media for technical learning, such as watching tutorials and participating in skill-based forums.

Table 2.1: Correlation Between Social Media Usage and Skill Acquisition

Variable	Mean Score	Correlation Coefficient (r)	p-value
Social Media Usage	3.9	0.72	0.000*
Skill Acquisition	3.8		

(*Significant at $p < 0.05$)

Source: Authors' Survey, 2025

The results reveal a strong positive correlation ($r = 0.72$, $p < 0.05$) between social media usage and skill acquisition. This indicates that students who frequently use social media are more likely to acquire technical skills, such as programming, graphic design, and engineering concepts, through platforms like YouTube, LinkedIn, and Facebook groups. The high mean score for skill acquisition (3.8) suggests that many students actively leverage social media for learning practical skills, especially in areas where traditional classroom instruction may be insufficient. The assertion of a strong positive correlation between social media usage and skill acquisition among students is supported by various studies, while some research presents contrasting views regarding the

implications of this relationship.

A study highlighted that social media significantly enhances vocational skills acquisition among university students, with findings indicating that high engagement with platforms like YouTube and LinkedIn correlates positively with skill development in areas such as programming and graphic design. This aligns with the reported correlation of r = 0.72 in your results, suggesting that frequent users are more likely to acquire relevant technical skills (Olomojobi *et al.,* 2024). Another study found that social media positively influences creativity and innovation skills among students, suggesting that the constant interaction with diverse content fosters an environment conducive to skill acquisition. The results indicated a high level of agreement among respondents regarding the role of social media in enhancing their creative problem-solving abilities (Nwolu, 2021). Some researchers argued that the effectiveness of social media as a learning tool may vary significantly among students based on their individual engagement levels and motivations. Some studies suggest that not all students utilise these platforms effectively for educational purposes, which could lead to inconsistent outcomes regarding skill acquisition (Nlebem, 2023). There is substantial evidence supporting the positive correlation between social media usage and skill acquisition; it is essential to consider potential distractions and the need for structured educational frameworks to maximise these benefits effectively.

Supporting Qualitative Insights: From open-ended responses, students highlighted specific platforms that contribute to skill acquisition:

- *"YouTube is my go-to platform for learning practical skills like autoCAD and video editing. The step-by-step tutorials make it easier to understand."*
- *"In WhatsApp groups, we share resources, discuss technical assignments, and even collaborate on projects."*

These insights reinforce the role of social media as a complementary tool for hands-on learning in technical education.

Objective 3: Impact of Social Media Usage on Academic Performance

The impact of social media usage on academic performance was analysed using regression analysis. Academic performance was measured by self-reported GPA scores and responses to questions about study habits.

Table 3.1: Regression Analysis of Social Media Usage and Academic Performance

Variable	Beta Coefficient (β)	Standard Error	t-value	p-value
Social Media Usage	-0.18	0.07	-2.57	0.011*
Constant	3.35	0.12	27.92	0.000

(*Significant at $p < 0.05$)

Source: Authors' Survey, 2025

The regression analysis shows a mild but significant negative relationship between social media usage and academic performance ($\beta = -0.18$, $p < 0.05$). This suggests that students who spend excessive time on social media, especially for non-academic purposes, may experience a slight decline in their academic performance. The negative beta coefficient indicates that for every unit increase in time spent on social media, there is a corresponding slight decrease in GPA. The assertion of a mild but significant negative relationship between social media usage and academic performance, indicated by a beta coefficient of $\beta = -0.18$ supported by various studies while also facing some contrasting viewpoints.

Research has consistently shown that excessive social media usage can lead to a decline in academic performance. For instance, a study among medical students found a weak negative correlation between social media usage and GPA, suggesting that higher time spent on social media is associated with lower academic achievement (Alshanqiti, 2023). This supports the claim that increased social media engagement for non-academic purposes may detract from academic responsibilities. A study by the University of Delaware found that frequent social media use among middle school students was correlated with decreased academic achievement. This research highlights that as the frequency of social media engagement increases, academic performance tends to decline, reinforcing the idea that excessive use can be detrimental to educational outcomes (Henderson, 2024).

Some research suggests that while there may be negative effects associated with excessive use, social media can also enhance

academic performance when used appropriately. For example, a study indicated that engaging in academic discussions and utilising social media for educational purposes could lead to improved grades and skill acquisition (Sakhieva *et al.,* 2024). This suggests the need for a nuanced understanding of how social media is utilised by students. While there is substantial evidence supporting the assertion of a negative relationship between excessive social media usage and academic performance, it is essential to consider the context of usage and individual differences among students to fully understand this dynamic.

Table 3.2: Usage and individual differences among students

Aspect	Percentage (%)
Daily Social Media Usage	56%
Time Devoted to Academics	38%
Difficulty in Regulating Usage	48%
Preference for Entertainment	35%

Source: Authors' Survey, 2025

55% of respondents reported spending more than 3 hours daily on social media, with only 40% of that time devoted to academic activities. This disproportionate allocation of time likely contributes to the observed negative effect on academic performance. 48% of respondents reported difficulty in regulating their social media usage and 35% admitted to prioritising entertainment over academic activities on social media platforms.

Objective 4: Challenges and Opportunities of Using Social Media

To identify challenges and opportunities associated with using social media for academic purposes, descriptive statistics were used alongside thematic analysis of qualitative responses.

Table 4.1: Challenges of Using Social Media for Academic Purposes

Challenge	Number of Respondents	Percentage (%)
Distraction from Non-Educational Content	165	55%
Poor Internet Access	120	40%
High Cost of Data	88	29.3%
Inadequate Digital Literacy	77	25.6%

Source: Authors' Survey, 2025

The major challenge identified by students is distraction from non-educational content (55%), such as social media feeds and entertainment videos. Poor internet access (40%) and high data costs (29.3%) are also significant barriers, particularly for students in rural or underserved areas. Additionally, 25.6% of respondents reported inadequate digital literacy, which limits their ability to effectively use social media for academic purposes. The findings regarding the impact of social media usage on academic performance highlight a complex relationship influenced by various factors, including distraction, internet access, data costs, and digital literacy. Several authors provide insights that support or contrast these assertions.

Research by Alnjadat et al. (2021) indicates that excessive social media use can lead to distractions, adversely affecting academic performance. Their study found that students who engaged with social media for entertainment purposes often reported lower academic outcomes, reinforcing the assertion that non-educational content can detract from learning efforts. The importance of digital literacy is underscored in the study by Ansari and Khan (2020), which notes that students lacking the necessary skills to navigate social media effectively may struggle to utilise these platforms for academic purposes. This aligns with the finding that 25.6% of respondents reported inadequate digital literacy as a barrier to their educational engagement.

While distractions are a concern, some studies argue that social media can enhance academic performance when used appropriately. For instance, Gordon and Ohannessian (2024) found that structured use of social media could facilitate collaboration and knowledge sharing among students, potentially leading to improved academic outcomes. While the challenges identified, such as distractions from non-educational content, poor internet access, high data costs, and inadequate digital literacy, are supported by various authors,

it is essential to consider the potential benefits of social media when used effectively in educational contexts. Balancing these aspects can help optimise the role of social media in supporting student learning.

Conclusion

The study found that social media significantly influences skill acquisition among technical education students but poses challenges to academic performance due to distractions. The findings underscore the need for structured integration of social media into technical education to maximise its benefits while minimising its drawbacks.

Recommendations

1. Universities should provide digital literacy training for students and lecturers to enhance effective social media usage.
2. Policies regulating the use of social media for academic purposes should be developed to prevent distractions.
3. Investment in reliable internet infrastructure is essential to enable seamless access to online learning resources.
4. Educators should curate and recommend high-quality social media content tailored to technical education.

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DOMESTIC ENERGY CRISIS AND WOOD CHARCOAL MAKING: A MAJOR THREAT TO FOREST RESERVES IN NORTHERN NIGERIA, KATSINA STATE EXPERIENCE

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ABSTRACT

Wood charcoal has been extensively used as a source of energy for household heating and as a cheaper alternative to petroleum products. This study was conducted to assess the socio-economic factors leading to the choice of wood charcoal as a better source of heating energy over petroleum fuels and the consequences of this choice. A structured questionnaire was used to collect information related to the use of wood charcoal among households in Dutsin-ma town, Katsina state. Results obtained revealed that the use of wood charcoal was on the increase at an alarming rate, with about 77% of the sampled households who use wood charcoal as their cooking fuel daily. The results also revealed that kerosene and firewood were the next most competitive alternatives to wood charcoal among the households. Affordability due to lesser cost (63%) and consistent availability constituted the major reasons for the households to resort to wood charcoal. It was observed that rational trade and marketing infrastructures, efficient use, also have significant positive impacts by improving resource conservation as well as enhancing the people's economy. It was recommended that sustainable production and use of wood charcoal should be ensured through proper management and planning of the supply sources.

Keywords: Wood, charcoal, Renewable energy, Domestic heating, Deforestation

Introduction

Charcoal is a dark grey residue consisting of Carbon and any remaining ash, produced by the slow process of heating wood and other substances in the absence of oxygen, a process called Pyrolysis. It is a cheap source of fuel to purchase and use but not without some challenges (Kofo, et.al., 2019). Wood charcoal and firewood are the most commonly used forms of energy in domestic cooking and heating, especially in rural areas where petroleum fuels are scarce and considered expensive. Wood charcoal and firewood are also used as energy sources in small-scale businesses such as meat processing, restaurants, bakeries, street food kiosks, brick-making, and drying produce (WHO, 2006). The wood fuel value chain is a significantly important factor in our economy as it provides income, employment, livelihoods, and energy security. Charcoal production constitutes an integral energy source and a major livelihood component in most developing countries especially those whose forest wood resources are suitable for its production (Zulu & Richardson, 2013).

On the Global outlook, the charcoal industry is a multibillion-dollar industry. The Food and Agricultural Organization (FAO) of the United Nations (2017) asserts that over 40 million metric tonnes of charcoal are consumed worldwide and that on average, 2.4 billion people rely on wood and charcoal for their daily fuel requirements. As of today, Nigeria ranks second to Brazil in the business of charcoal production (Kofo, et.al., 2019). The western countries, particularly prefer Nigeria's charcoal, because the country is rich in tropical hardwood, which burns slower and hotter. Nigeria presently exports about 380,000 metric tonnes of charcoal annually (FAO, 2007). The business involves the sourcing, storage, packaging (in about 5 Kg bags), and transportation of the hardwood charcoal to any desired destination. Charcoal production has risen in recent decades due to a rise in demand among urban households and enterprises (FAO, 2010).

However, increased large-scale charcoal production, primarily in sub-Saharan Africa, has caused growing concerns due to its threat of deforestation, land degradation and climate change impacts. It is seen as the most environmentally devastating aspect of this traditional energy supply chain, and despite increasing per capita income, higher electrification rates, and significant renewable energy potential, charcoal remains the dominant source of cooking and heating energy for 80% of households in Sub Saharan Africa (SSA) (Zulu and Richardson, 2013). As a traditional fuel that has been used for hundreds of years, wood charcoal serves as a lifeline for the rapidly increasing populations in the urban centers of the region, in addition to potentially significant portions of the rural population. This is due to its low cost compared to other fuels like kerosene and liquefied petroleum gas (LPG) (Ellegard and Nordstrom, 2003).

Figure 1: Heap of fire wood used in charcoal making.

Again, inefficient production and utilization of charcoal has been linked to several environmental and health problems as over 4 million deaths occur globally on an annual basis resulting from illnesses related to the smoke generated by indoor combustion, which mainly affects women and small children (Bailis, et al., 2005). Coughing, sneezing, and headaches are common among women who work in smoky kitchens, while also, a large number of cases of bronchitis, lung cancer, asthma, and tuberculosis have been linked to smoke from indoor combustion (WHO, 2006).

Figure 2: Exposure to Environmental Hazards

Additionally, unsustainable wood fuel processes result in 1-2.4Gt of carbon dioxide equivalent (CO_2) per year, which constitutes about 2.7% of total anthropogenic Green House Gases (GHG) emissions (FAO, 2017). These emissions are generated at various stages of the value chain and wood production processes, with the carbonization of wood into charcoal and its utilizations being the greatest contributors. In very inefficient operations, charcoal production can result into 9kg of CO_2 per kilogram of charcoal produced while 29-62%, 28-61% and 9-18% of emissions comes from wood sourcing, carbonization of the wood into charcoal and end use respectively (FAO, 2017). These negative effects of charcoal production on the environment and human health have since raised some growing concerns among policymakers concerned with the management of forest resources. Hence, the need to understand the environmental and health implications and the rate of charcoal production and utilization in Dutsin-ma Local Government Area, Katsina State, Nigeria.

Charcoal Making Process

Most charcoal-making technologies employ internal heating involving partial combustion/pyrolysis of the feedstock. In this process, kilns made of concrete or brick are constructed in a simple and less costly fashion.

Traditional Wood Carbonization Technologies

The kilns in local or traditional charcoal technologies are the most widespread worldwide, due to their simplicity and low cost, especially for small-scale charcoal producers (Kammen and Lew, 2005). They are not used in flat sites and are generally built with baked bricks, clay, and sand mortar. More than one kiln is usually used, which are disposed as batteries or tandems (Vilela and Lora, 2014). The kilns' operation usually starts with the firewood loading, followed by carbonization/pyrolysis and unloading of charcoal. The use of dry firewood is necessary for good carbonization, because the firewood moisture directly influences the yield of the kiln. The following figure provides a succinct description of some charcoal production processes, which represent the different fundamental principles of wood pyrolysis in charcoal manufacture.

Figure 3. Traditional kilns in Brazil and Cambodia

Figure 4: Final kiln (left), African design constructed by community members

Figure 5: Modern kilns (France).

Methodology

The Study Area

Dutsin-ma is one of the 34 Local Governments in Katsina state, Nigeria. The town of Dutsin-ma, which is the Local Government headquarters, lies approximately on latitude 12.4539oN and longitude 7.49723oE. The entire Local Government Area covers an area of about 527 km^2 and is located between latitude 12^{o}27'18" N and 12^{o}27'N, and longitude 7^{o}29' and 7^{o}30'E. These coordinates place the Dutsin-ma Local Government in the northern region of Nigeria. It is approximately 60 kilometers away from the state capital of Katsina.

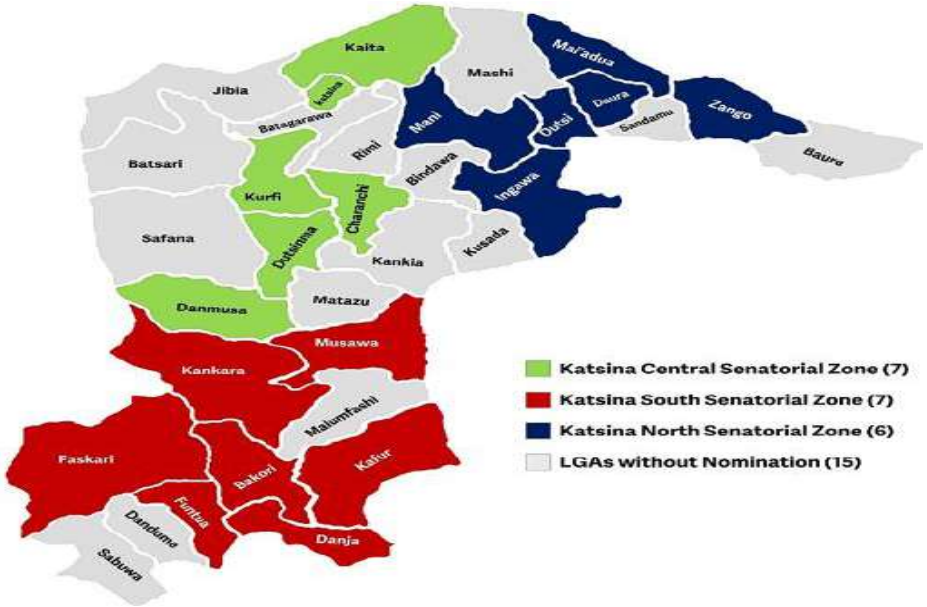

Figure 6: Map of Katsina State Showing the 34 Local Government Areas

The Local Government had a population of 169,671 as of the 2006 National Population Census. However, more recent estimates suggest a population of approximately 211,959 as of 2015 and 303,500 as of 2022. Still, these figures are based on projections and may not accurately reflect the current population of the Local Government (NPCN web).

Population of the Study

The target populations include all persons/households in Dutsin-Ma town and some selected local communities in the outskirts of the town.

Sample and Sampling Techniques

A stratified-random sampling technique was used to obtain a total sample of seventy-two (72) persons. This sampling strategy is based on existing knowledge about the respondents and the anticipated relevance of their response to the problem being investigated. Twelve (12) persons identified as charcoal users from each of the selected communities (Kadangaru D/Ma, Gawo D/Ma, Bayan Area D/Ma, Hayin Gada D/Ma, Unguwar Dabino D/Ma, Kofa D/Ma) within the study area were chosen for the study.

Instrument and Method of Data Collection

The instrument used for data collection from the respondents was a structured questionnaire. The questionnaire had two parts, part A and part B. Part A contained the Bio-data of the respondents, and part B contained questions related to the use and consumption of wood charcoal. Options were provided for the respondents to choose from, by ticking the option that best expressed their personal opinions on each issue raised. The questionnaire was distributed equally (12 each) to the selected communities, and for each community, 12 households were identified and one member for each household was chosen to represent the household in filling the questionnaire. The filled questionnaires were retrieved (without loss) and used to generate the data used in this research.

Method of Data Analysis

While processing and analysing the data obtained from the respondents, descriptive statistics, such as simple percentage, were used. The choice of this statistical tool was to allow for easy comprehension of the population having a particular perception or view on each issue being discussed as per the findings of the study.

Results

The Results obtained in this study are presented and discussed in Tables 1 to 11.

Item 1: Sex of Respondents

The sexes of the respondents are presented in the Table below.

Table 1: ***Sex of Respondents***

Sex	Frequency	Percentage (%)
Male	25	34.72
Female	47	65.28
Total	**72**	**100**

From Table 1, 25 respondents (representing 34.72%) were male while 47 (representing 65.28%) were female. This shows that the majority of those who participated in the research were female.

Item 2: Age of the Respondents

The respondents were of varying ages as presented in Table 4.3

Table 2: ***Age of Respondents***

Age (yrs.)	Frequency	Percentage (%)
15-20	25	34.72
21-30	13	18.06
31-40	14	19.44
Above 40	20	27.78
Total	**72**	**100**

From Table 2, 25 (representing 34.72%) of the respondents were between 15-20 ages, 13 (representing 18.06%) were between 21-30 years, 14 (representing 19.44%) are 31-40 years and 20 (representing 27.28%) of the respondents were between 40 years and above. This indicates that the majority of those that participated in the research were 15-20 years old and 40 years and above.

Item 3: Marital Status

The respondents have different marital status, presented in the Table below.

Table 3: Marital Status of Respondents

Marital Status	Frequency	Percentage (%)
Male	50	69.44
Female	22	30.56
Total	**72**	**100**

Table 3, shows that 50 respondents (representing 69.44%) were married while 22 (representing 30.56%) were single. This implies that the majority of the participants in the research were married and therefore might be real users of wood charcoal.

Item 4: Occupation of Respondents

The varied Occupations of the respondents are presented in Table 4 below.

Table 4: ***Occupation of Respondents***

Occupation	Frequency	Percentage (%)
Students	4	5.65
Civil Servants	32	4.44
Farmers	12	16.67
Petty Traders	21	29.17
Large Scale business	3	4.17
Artists	0	0
Others	0	0
Total	**72**	**100**

From Table 4, 4 respondents (representing 5.65%) were students, 32 (representing 44.44%) were civil servants, 12 (representing 16.67%) were farmers, while 21 Respondents (representing 29.17%) were petty traders and 3 (representing 4.17%) were large-scale business men. However, no respondent was an artist or was doing any other business outside the ones listed. This shows that the majority of the respondents were either civil servants, or were petty traders.

Item 5: Educational Qualification

The educational qualifications of the respondents are presented in the Table below.

Table 5: ***Educational Qualification of Respondents***

Qualification	Frequency	Percentage (%)
S.S.C. E	30	41.67
ND/NCE	20	27.78
Master Degree	0	0
PhD	5	6.94
Quranic School	0	0
Others	17	23.61
Total	**72**	**100**

From the Table 5 above, 30 respondents (representing 41.67%) were secondary graduands (S.S.C.E holders), 20 (representing 27.78%) were ND or N.C.E holders, 5 (representing 6.94%) were PhD holders and 17 (representing 23.61%) were holders of qualifications other than those on the list. However, none of the respondents holds a Qur'anic education qualification or a master's degree. This indicates that the respondents hold various qualifications.

Item 6: For how long have you been using wood charcoal for domestic heating?

The duration of the use of charcoal as a domestic energy source by households is presented in Table 6.

Table 6: ***Duration of use of charcoal by households***

Duration (yrs.)	Frequency	Percentage (%)
1-3	30	41.67
3-5	21	29.17
6-10	18	25.00
More than 10	3	4.17
Total	**72**	**100**

The Results in Table 6, reveal that 30 respondents (representing 41.67%) used charcoal for 1-2 years, 21 (representing 29.17%) used

it for 3-5 years, while 18 respondents (representing 25.00%) had between 6-10 years and 3 (representing 4.17%) have been in the business of using charcoal as domestic fuel for more than 10 years. This shows that all the respondents have been using charcoal as a domestic energy source for varying lengths of time.

Item 7: On the average, what quantity of wood charcoal do you use in your house per day?

The quantity of charcoal used per day per household is presented in Table 7

Table 7: ***Daily consumption rate of charcoal per household***

Quantity (measures)	Frequency	Percentage (%)
1-2	38	52.78
3-4	20	27.78
5 or more	14	19.44
Total	**72**	**100**

The results in Table 7, indicates that 38 households (representing 52.78%) consume 1-2 measures of wood charcoal per day, 20 (representing 27.78%) of the respondents use 3-4 measures of wood charcoal per day in their houses while 14 (representing 19.44%) of the respondents uses 5 or more measures of wood charcoal per day. This shows that the majority of the households consumes an average of 1-2 measures of charcoal per day. The environmental impact of high charcoal production and use environmental pollution, timber shortage, soil erosion, climatic change, loss of beneficial medicinal plants, forestland depletion and degradation, and reduction and extinction of wildlife species (Lasisi, et.al., 2023). In addition, lack of modern tools most often results in the use of human labor throughout the entire production process and may potentially lead to moderate or severe injuries (Eniola and Odebode, 2018).

Item 8: What was your dominant domestic fuel before you adopted wood charcoal

The respondents' views on the dominant domestic fuel used by household before adopting wood charcoal are presented in Table 8.

Table 8: ***Dominant domestic fuel used by households before adopting wood charcoal***

Dominant domestic fuel	Frequency	Percentage (%)
Fire wood	35	48.61
Kerosene	16	22.22
Cooking	13	18.06
Electric cookers	5	6.94
Others	3	4.17
Total	**72**	**100**

Table 8 shows that 35 households (representing 48.61%) used firewood. 16 (representing 22.22%) of the respondents used kerosene in their household, 13 (representing 18.06%) were using cooking gas, 5 (representing 6.94%) used electric stoves while 3 (representing 4.17%) used others means of domestic fuel in their household before they adopted wood charcoal. This shows that the majority of the respondents predominantly used firewood before they adopted wood charcoal for their domestic heating.

Item 9: What informed your decision to take wood charcoal as a replacement to other domestic fuels?

The various reasons for the use of charcoal by households as a replacement for other domestic fuels are presented in Table 9.

Table 9: *Reason for using wood charcoal by the respondents as an alternative to other fuels.*

Reason for using charcoal	Frequency	Percentage (%)
Availability	25	34.72
Lesser cost	16	22.22
High heating efficiency	5	6.94
Non-smoking fires	6	8.33
All of the above	20	27.78
Total	**72**	**100**

The results in Table 9, shows that 25 of the households (representing 34.72%) were choose charcoal because of its availability, 16 (representing 22.22%) of the respondents use charcoal due to its less cost, 5 (representing 6.94%) used charcoal because of high heating efficiency while 6 (representing 8.33%) used charcoal because of its non-smoking fires and 20 (representing 27.78%) used charcoal because of a combination of all the stated reasons. This indicates that the respondents have different reasons for using charcoal with the majority using it either because of its availability or a combination of all the reasons.

Item 10: How much on the average do you spend daily on wood charcoal?

The amount spent daily on wood charcoal by households is presented in Table 10.

Table 10: Amount spend on wood charcoal per day by Household

Amount (Naira)	Frequency	Percentage (%)
100 – 200	40	55.56
300 – 500	16	22.22
600 – 1000	6	8.33
1000 – 2000	6	8.33
> 2000	4	5.56
Total	**72**	**100**

The results in Table 10 shows that, 40 households (representing 55.56%) spend N100 - N200 daily on charcoal, 16 (representing 22.22%) spend N300 - N500 daily on wood charcoal, and 6 each (representing 8.33%) of the respondent spends N600 - N1000 and N1000 - N2000 daily on wood charcoal respectively while 4 (representing 5.56%) spend more than N2000 daily on wood charcoal. This shows that the majority of the respondents spend N100 - N200 per day on wood charcoal.

Item 11: In the absence of wood charcoal, which other domestic fuel do you use most?

The alternative sources of fuel for households in the absence of wood charcoal are presented in Table 11.

Table 11: ***Alternative sources of fuel in the absence of wood charcoal***

Source of fuel	Frequency	Percentage (%)
Fire wood	39	54.17
Kerosene	13	18.06
Cooking gas	12	16.67
Electricity	8	11.11
Total	**72**	**100**

The results in Table 11, reveal that 39 respondents (representing 54.17%) from the households uses fire wood only in the absence of wood charcoal 13 (representing 18.06%) of the respondents uses kerosene and 12 (representing 16.67%) uses cooking gas, while 8 (representing 11.11%) uses electricity in the absence of charcoal. This indicated that the majority of those who participated in the research use firewood in the absence of wood charcoal. The use of firewood and charcoal for domestic fuel energy provision points to the tendency for increased deforestation and desertification as trees are cut down without commensurate replacement.

Conclusion

Wood charcoal has for some decades been extensively used as a fuel for household heating and has almost replaced other fuels. This study was conducted to assess the socio-economic factors leading to the choice of wood charcoal as a source of heating energy over petroleum and other fuels. Results obtained from this study revealed high usage of wood charcoal, which is on the increase, resulting in rampant felling of trees. This problem is becoming severe in the study area due to reasons of availability, low cost, and high energy efficiency among others. If the problem is allowed to continue to exist unchecked, it can lead to serious deforestation, desertification, and possibly enhance global warming phenomena and related issues. While, the health impact of charcoal production causes body wounds, skin irritation and burns, back and muscle pains, respiratory impairment, frequent eye problems, falling and slipping, poisonous bites from animals, and traffic accidents.

Recommendations

Therefore, to alleviate the challenges associated with charcoal production and use, the following measures are recommended:

5. The local community should adopt the practice of replanting and maintenance of various tree species sustainably used for charcoal production.
6. Government and all other relevant stakeholders should introduce and implement policies to incentivize the adoption of clean and renewable energy sources, and minimize reliance on wood charcoal production for cooking and other domestic heating activities.
7. Government and all other critical stakeholders should implement measures aimed at mitigating deforestation and carbon emissions, such as sustainable forest management practices and reforestation programmes.

8. The use of personal protective equipment, provision of on-site first aid kit and periodic medical examination among charcoal producers should be encouraged.
9. Government should also prioritize its policies to ensure effective control and maintenance of price stability to control inflation and mitigate its adverse effects on poverty.
10. An awareness campaign should be intensified on the health and environmental consequences of charcoal production, and it should be promoted
11. Wood charcoal producers and sellers should adopt integrated approaches capable of addressing the interconnected challenges posed by poverty, environmental degradation, and climate change, to align with the Sustainable Development Goals (SDGs) and to promote inclusive and sustainable development in Nigeria.

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DIGITAL TRANSFORMATION, QUALITY ELECTRICAL/ELECTRONIC TECHNOLOGY EDUCATION, BALANCING OPPORTUNITIES AND CHALLENGES IN 21ST-CENTURY LEARNING

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ABSTRACT

The rapid digital transformation in the 21st century has significantly impacted educational systems worldwide, including Electrical/Electronic Technology Education (EETE). This study explores the balance between opportunities and challenges posed by digital transformation in EETE, focusing on how quality education can be maintained in the face of evolving technological demands. The study was motivated by the observed gap between the integration of digital technologies in EETE and the preparedness of educators and students to leverage these tools effectively. Despite advancements, issues such as inadequate infrastructure, limited digital competencies, and disparities in access hinder optimal learning outcomes. The study, therefore, examines the extent to which digital transformation influences the quality of EETE and the strategies needed to optimize its benefits. A descriptive survey research design was adopted, with a sample size of 119 participants comprising educators and students in technical institutions. Data were collected using structured questionnaires and analysed using mean, standard deviation, correlation, and analysis of variance (ANOVA). The findings revealed a significant positive correlation between digital transformation and the quality of EETE. However, disparities in digital access and skill levels among students and educators created challenges in achieving uniform learning outcomes. The study concludes that while digital transformation presents vast opportunities for enhancing EETE, addressing digital literacy gaps, improving infrastructure, and adopting strategic policies are crucial for maximizing its benefits. It recommends targeted training for educators, investment in digital learning resources, and government-private sector collaboration to bridge the digital divide and ensure inclusive, high-quality technical education.

Keywords: 21st-Century Learning, Digital Transformation, Educational Infrastructure, Electrical/Electronics Technology Education, Technology Integration

Introduction

The 21st century has ushered in a rapid digital transformation, profoundly influencing educational systems worldwide, including

Electrical/Electronic Technology Education (EETE). The integration of digital tools and platforms has enhanced learning experiences, offering interactive simulations, virtual laboratories, and access to a wealth of online resources. For instance, Estonia's education system incorporates technology deeply, with students learning robotics from age seven and utilizing virtual reality to enhance subjects like geography and chemistry. In Estonia, the ProgeTiger program ensures that teachers are competent and appropriate curriculum materials are readily available, providing free materials on how to teach students programming through play, using robots like Blue-Bot, LEGO, Dash, and Dot. Furthermore, Estonia has launched AI Leap, an initiative to teach AI skills to high school students, in collaboration with tech companies. Starting in September, 20,000 students aged 16-17 will have free access to AI learning tools, and 3,000 teachers are beginning AI training workshops. These initiatives demonstrate the profound impact of digital transformation on education, highlighting the importance of integrating technology into curricula to prepare students for the evolving demands of the 21st century (John and Richard 2025).

A primary obstacle is the lack of reliable electricity and limited internet connectivity. According to the World Bank, only about 59% of Nigerians have access to electricity, with rural areas being the hardest hit. This inconsistency hampers the use of digital tools in education. Additionally, poor broadband infrastructure, especially in rural regions, exacerbates the digital divide between urban and rural areas, limiting the effectiveness of digital learning platforms. The financial burden associated with acquiring digital devices and software is another significant barrier. Many educational institutions and students struggle with the high costs of tuition fees, software, textbooks, and necessary equipment. These expenses can be prohibitive, preventing many from accessing quality IT education and contributing to a skills gap in the workforce. Many technical institutions in Nigeria continue to use outdated curricula that do not align with current industry standards. This disconnects results in graduates who may lack the practical skills and up-to-date knowledge required in today's job market. Emphasizing theoretical knowledge over practical experience further exacerbates this issue, leaving students ill-prepared for real-world applications (Haruna, Ahmad & Abubakar, 2025). Cultural and institutional resistance to adopting digital tools also poses a challenge. Educators and administrators accustomed to traditional teaching methods may be hesitant to embrace digital learning due to concerns about its effectiveness or fear of disrupting established practices. Additionally, there is a significant skills gap, with many teachers lacking the necessary digital literacy to effectively integrate technology into their teaching. While there have been efforts to create policies supporting digital transformation in education, gaps remain. The absence of a cohesive national policy on digital education and inconsistent implementation of initiatives at both state and federal levels hinder progress. This lack of coordination leads to uneven adoption of digital tools across regions (Haruna, Ahmad & Abubakar, 2025).

Technical institutions often struggle to acquire and maintain up-to-date equipment due to financial constraints and bureaucratic processes. This limitation hampers practical training and skills development, as students are unable to gain experience with the latest technologies used in the industry. Addressing these challenges is crucial for maximizing the benefits of digital transformation in EETE. Strategies such as targeted training programs for educators, investment in digital learning resources, and collaborations between government and the private sector are essential. These measures aim to bridge the digital divide, enhance digital literacy, and ensure that technical education remains relevant and effective in meeting the evolving demands of the global economy. Digital transformation offers vast opportunities to enhance EETE, a concerted effort to address infrastructural limitations, update curricula, and improve digital competencies among educators and students is vital. Such efforts will ensure that the integration of digital technologies leads to improved learning outcomes and aligns technical education with contemporary industry needs.

Statement of the Problem

The rapid advancement of digital technologies has significantly transformed the global educational landscape, offering new opportunities for enhanced teaching and learning. However, technical education and emerging technology education (EETE) in

Nigeria continue to face substantial challenges in integrating digital tools effectively. Despite the global shift towards digital learning, many technical institutions in Nigeria struggle with inadequate infrastructure, including unreliable electricity supply and limited internet connectivity, which hampers the implementation of digital education. The World Bank (2023) reported that only 59% of Nigerians have access to electricity, with rural areas being the most affected, further widening the digital divide between urban and rural educational institutions. Moreover, the high cost of digital devices, software, and internet services presents a financial barrier for students and educators, making it difficult to fully embrace digital transformation in education. Many technical institutions operate with outdated curricula that do not align with modern industry demands, resulting in graduates who lack the necessary practical skills for the evolving job market. Additionally, resistance to adopting digital tools among educators and administrators, coupled with a significant digital literacy gap, further hinders the effective integration of technology in technical education.

Despite efforts by the Nigerian government and private organizations to promote digital learning, there remains a lack of a cohesive national policy and consistent implementation strategies. This has led to disparities in digital education access across different regions. The limited availability of up-to-date equipment and software in technical institutions also affects students' ability to acquire hands-on experience with modern technologies, which is crucial for skill development in technical and vocational fields. Given these persistent challenges, it is imperative to critically examine the barriers to digital transformation in technical education in Nigeria. This study seeks to investigate these issues and propose practical solutions that will enhance digital education accessibility, improve curricula, and foster digital literacy among educators and students. Addressing these problems is crucial for ensuring that Nigeria's technical education system aligns with contemporary industry standards, thereby equipping graduates with the necessary skills to thrive in a technology-driven economy.

Research Questions

1. How do infrastructural challenges, such as unreliable electricity and limited internet connectivity, impact the effective implementation of digital education in technical institutions in Nigeria?
2. To what extent do financial constraints and outdated curricula affect the adoption of digital learning tools and technologies in technical education?

Hypothesis

H_0 (Null Hypothesis): There is no significant relationship between infrastructural challenges (electricity and internet connectivity) and the effectiveness of digital education implementation in technical institutions in Nigeria.

Purpose of the Study

The purpose of this study is to examine the challenges hindering the effective implementation of digital education in technical institutions in Nigeria and to propose strategies for enhancing digital integration to improve learning outcomes and workforce readiness. The study put forward the following objectives to guide the study. These include to:

i. assess the impact of infrastructural challenges, such as unreliable electricity and limited internet connectivity, on the adoption of digital education in technical institutions.
ii. evaluate the effects of financial constraints and out-dated curricula on the accessibility and effectiveness of digital learning tools in technical education.
iii. explore possible strategies for improving digital education adoption, including policy interventions, investment in digital infrastructure, and capacity building for educators.

Conceptual Framework of Digital Education in Technical Institutions

Digital education refers to the integration of digital technologies and resources into teaching and learning processes. It encompasses various instructional methods, including online learning platforms, multimedia resources, virtual classrooms, and interactive simulations. The primary goal of digital education is to improve access to education, enhance engagement, and provides students with a more flexible and personalized learning experience (Haruna, 2021). In the context of technical and vocational education (TVE), digital education plays a crucial role in enhancing the acquisition of both practical skills and theoretical knowledge. Unlike traditional academic disciplines, technical and vocational education focuses on skill development that directly translates into workplace competencies. The incorporation of digital technologies in TVE enables students to gain hands-on experience through virtual simulations, augmented reality (AR), and artificial intelligence (AI)-driven training programs. These tools help learners practice technical tasks in a risk-free, interactive environment, improving their proficiency before transitioning into real-world applications. Furthermore, online learning platforms such as Learning Management Systems (LMS), Massive Open Online Courses (MOOCs), and video tutorials have expanded the reach of technical education beyond the confines of physical classrooms. These platforms provide students with access to recorded lectures, interactive assignments, and real-time feedback from instructors, making education more flexible and accommodating to diverse learning needs. A technologically evolving workforce demands that TVE institutions continually update their teaching methods to include industry-relevant digital tools. The integration of digital resources ensures that students develop competencies in automation, coding, digital manufacturing, and data analytics, which are increasingly essential in various technical professions, including engineering, information technology, and industrial design (World Bank, 2022). Moreover, digital education promotes inclusivity by addressing geographical and financial barriers. In many developing regions, access to quality technical education is limited due to inadequate infrastructure and financial constraints. Digital platforms bridge this gap by providing students with remote learning opportunities, enabling them to acquire industry-relevant skills regardless of their location (Haruna, 2021).

Infrastructural Challenges in the Adoption of Digital Education in Nigeria

The effective adoption of digital education in Nigeria is significantly hindered by infrastructural challenges, particularly in internet connectivity, access to digital devices, and unreliable electricity supply. These barriers prevent many institutions from fully implementing e-learning, reducing students' ability to engage with online resources and digital learning platforms. One of the most pressing issues affecting digital education in Nigeria is limited internet access, particularly in rural and underserved areas. According to Statista (2023), only about 43.2% of Nigerians have access to the internet, with connectivity being highly concentrated in urban centers while many rural communities remain underserved. Poor broadband infrastructure exacerbates this issue, as many universities struggle with low bandwidth, slow internet speeds, and high data costs (Adegbite et al., 2022). The lack of stable internet prevents students and educators from effectively utilizing online learning platforms such as Learning Management Systems (LMS), Massive Open Online Courses (MOOCs), and virtual classrooms. Moreover, high internet costs further restrict accessibility. Research by the World Bank (2022) highlights that internet affordability remains a significant challenge in Nigeria, where data costs are relatively high compared to income levels. Many students and institutions cannot afford continuous access to online courses, video lectures, or research databases, limiting their ability to benefit from digital education. The lack of necessary digital devices and technological infrastructure further hampers the effective adoption of digital education in Nigeria.

Olanrewaju and Yusuf (2023) found that many universities lack adequate computer laboratories, smart boards, and multimedia tools, making it difficult for students to participate in practical digital learning activities. Personal computers, tablets, and smartphones are often required for online learning, but their high cost makes them inaccessible to many students, particularly those from low-income backgrounds. Furthermore, many educational institutions lack modern digital resources, such as updated software, e-books, and

simulation tools, which are essential for technical and vocational training. Ojo and Igbinedion (2021) argue that the lack of up-to-date technology in Nigerian universities results in a mismatch between students' training and industry expectations, further widening the skills gap in the workforce. Another major infrastructure-related challenge is Nigeria's unreliable electricity supply, which disrupts digital learning and affects both students and institutions. The World Bank (2022) reports that only about 59% of Nigerians have access to electricity, with frequent power outages being a common issue. Many institutions lack the backup power systems needed to support digital classrooms and online learning environments, causing interruptions in teaching and learning activities. Students who rely on personal computers or mobile devices for e-learning often struggle to charge their devices regularly, further impeding their participation in digital education. According to Oladipo and Fagbohun (2023), inconsistent electricity supply forces many students to resort to cybercafés, generators, or other costly alternatives, making digital learning an expensive and inconvenient option.

Financial Constraints and Access to Digital Education in Nigeria

Financial constraints pose a significant challenge to the accessibility and effective implementation of digital education in Nigeria. The high cost of digital devices, software, and internet services creates a substantial burden for students, educators, and educational institutions, limiting participation in digital learning initiatives. The affordability of essential digital tools such as laptops, tablets, and smartphones remains a major issue for students, especially in low-income households. According to Afolabi and Olayemi (2023), over 60% of Nigerian students rely on mobile phones for online learning due to the prohibitive cost of laptops and personal computers. However, mobile phones often lack the functionality required for effective engagement in technical education, where software-based simulations and practical applications are essential. Additionally, internet services remain expensive and unreliable. Statista (2023) reports that Nigeria has one of the highest mobile data costs in West Africa, making it difficult for students to sustain long-term online learning. Even when internet services are available, fluctuating costs and unstable network coverage in rural and semi-urban areas disrupt learning processes (World Bank, 2022). Educational institutions also struggle to acquire and maintain the necessary technological infrastructure due to inadequate funding. Many public universities and technical institutions rely heavily on government subventions, which are often insufficient to cover the costs of digital transformation. Ojo and Igbinedion (2021) note that less than 15% of Nigeria's education budget is allocated to technological advancement in tertiary institutions, leading to outdated computer labs, inadequate digital resources, and a lack of funding for software licenses. Furthermore, private institutions that attempt to bridge this gap by investing in digital infrastructure often transfer the cost to students through increased tuition and technology fees. This further exacerbates the financial burden on students from lower-income backgrounds, reducing their ability to access digital education (Olanrewaju & Yusuf, 2023). Beyond hardware and internet expenses, educational software and digital learning platforms also require significant financial investment. Many technical courses depend on specialized software such as AutoCAD, MATLAB, and programming environments, which often require costly licenses. Adegbite, Olanrewaju, and Ajibola (2022) highlight that while some institutions adopt free alternatives, these versions may lack full functionality, limiting students' learning experiences. Subscription-based digital platforms, such as Coursera and Udemy, charge fees that are unaffordable for many Nigerian students, restricting access to high-quality online courses.

Government Initiatives and Policy Implementation in Digital Education in Nigeria

The Nigerian government has acknowledged the transformative potential of digital education and has introduced various policies and frameworks aimed at integrating technology into the educational system. These policies are designed to improve access to digital learning resources, enhance technical education, and equip students with the necessary digital competencies to compete in a technologically advancing global economy. However, despite these efforts, several challenges, including inconsistent implementation, inadequate funding, and infrastructural limitations, continue to hinder the effectiveness of these initiatives. One of the primary regulatory bodies overseeing digital education in Nigeria is the National Board for Technical Education (NBTE). The

NBTE is responsible for accrediting and regulating technical and vocational institutions, ensuring that curricula align with modern industry demands and incorporate digital skills training (NBTE, 2022). In recent years, NBTE has introduced E-Learning Guidelines for Technical Institutions, which emphasize the need for digital literacy, the use of online learning platforms, and the incorporation of virtual laboratories in technical education (Adebayo & Olaniyi, 2023). Additionally, the National Policy on Information and Communication Technology (ICT) in Education, implemented by the Federal Ministry of Education (FME, 2021), aims to promote the integration of ICT into all levels of education. The policy focuses on providing digital infrastructure, training educators in digital skills, and fostering partnerships with private technology firms to enhance access to digital learning tools.

Despite these policies, the effective adoption of digital education in Nigeria is often hampered by inconsistent implementation and insufficient funding. Many technical institutions lack the financial resources to acquire the necessary infrastructure, such as computers, software, and reliable internet connectivity. According to World Bank (2023), over 40% of tertiary institutions in Nigeria do not have adequate ICT facilities to support full-scale digital education. Moreover, bureaucratic inefficiencies and policy inconsistencies at both federal and state levels have slowed the expansion of digital learning. Ogunleye and Adedokun (2022) argue that while policies exist on paper, there is often a gap between formulation and execution, leading to delays in infrastructure development, lack of proper monitoring, and uneven adoption across regions. To bridge these gaps, collaborations between the government, private sector, and international organizations are essential. Private technology firms such as Google, Microsoft, and MTN Foundation have partnered with Nigerian institutions to provide digital training and subsidized internet access for students (Okonkwo & Akinbode, 2023). The World Bank and African Development Bank (AfDB) have also invested in ICT-driven education projects, including the provision of digital classrooms and e-learning platforms in select Nigerian universities. Additionally, initiatives such as Nigeria's Digital Economy Policy and Strategy (2020–2030) emphasize the need for multi-stakeholder involvement in driving digital transformation in education. The policy encourages corporate organizations to invest in ICT training programs, support the development of digital curricula, and establish innovation hubs within educational institutions (Federal Ministry of Communications and Digital Economy, 2020).

Methodology

This study adopted a descriptive survey research design to assess the challenges and prospects of digital education in Nigerian technical institutions. The survey method is appropriate as it allows for the collection of data from a large sample, providing insights into the infrastructural, financial, and policy-related barriers affecting digital education. The target population included lecturers, students, and administrators from selected institutions in Nigeria. A multi-stage sampling technique used, with 300 respondents selected across different institutions. A structured questionnaire used for data collection, covered demographic information, availability of digital tools, challenges affecting digital education implementation, and perceived effectiveness of current policies. The instrument subjected to expert review and reliability. The collected data analysed using descriptive statistics and inferential statistics. Ethical considerations include maintaining anonymity and confidentiality, obtaining informed consent, and adhering to human research guidelines.

Results

Table 1: Assess the impact of infrastructural challenges, such as unreliable electricity and limited internet connectivity, on the adoption of digital education in technical institutions

Items	Mean Score	Interpretation
Unreliable electricity supply significantly affects the effective use of digital learning tools in technical institutions.	3.15	High impact

Limited internet connectivity in rural areas hinders students' access to online educational resources.	3.25	High impact
Technical institutions with stable electricity and high-speed internet are more likely to implement digital education successfully.	3.33	High impact
The lack of adequate ICT infrastructure in technical institutions negatively impacts digital education adoption.	3.26	High impact

A mean score of 3.15 suggests that the majority of respondents agree that unreliable electricity significantly affects digital education adoption. With a mean score of 3.25, respondents confirm that limited internet connectivity is a major barrier to online learning in technical institutions. A higher mean of 3.33 suggests that stable electricity and internet significantly contribute to digital education implementation. The 3.26 mean score confirms that inadequate ICT facilities negatively impact digital education adoption. This study is inline with the study of Adepoju & Olanrewaju (2022) highlighted that the irregular power supply in Nigeria remains one of the primary obstacles to digital learning in technical institutions. Without a stable electricity supply, students and educators struggle to utilize digital tools effectively. Also, Nwosu & Agbaje (2023) found that in rural technical institutions, students often lack internet access, forcing them to travel long distances to access digital learning tools. This limitation discourages online learning adoption. Adebayo & Bello (2023) stated that inadequate ICT infrastructure, such as out-dated computer labs and lack of interactive learning platforms, negatively affects digital education adoption. They recommend increased government investment in digital infrastructure for technical education. Akinpelu & Ojo (2023) advocate for policy reforms that encourage telecommunications companies to subsidize internet services for educational institutions, thereby increasing digital learning accessibility.

Table 2: Evaluate the effects of financial constraints and out-dated curricula on the accessibility and effectiveness of digital learning tools in technical education

Items	Mean Score	Interpretation
The high cost of digital devices and software limits students' ability to participate in online learning.	3.2	High impact
Limited institutional funding for digital infrastructure reduces the effectiveness of digital learning in technical education	3.3	High impact
The financial burden on students and institutions affects the accessibility of digital education resources	3.3	High impact

A mean score above 3.0 suggests that respondents generally agree that financial constraints and out-dated curricula significantly affect digital education accessibility. The highest mean (3.3) indicates that institutional funding and affordability of digital resources are major barriers to digital education. This study corroborated several studies that have emphasized the necessity of collaborative efforts to enhance digital education in technical institutions. Okebukola (2021) highlighted that increased government funding is crucial for improving digital infrastructure in Nigerian educational institutions. Similarly, Adebayo and Olayemi (2022) argued that subsidizing digital learning tools can bridge the affordability gap for students and institutions, making digital education more accessible. Eze et al. (2023) emphasized the importance of improved internet connectivity, noting that unreliable access to online resources significantly hampers effective learning. Additionally, Haruna (2021) suggested that curricula should be updated regularly to integrate modern digital competencies, ensuring that graduates are equipped with industry-relevant skills. These contributions underscore the need for a multi-stakeholder approach to overcoming challenges in digital education adoption.

Table 3: Explore possible strategies for improving digital education adoption, including policy interventions, investment in digital infrastructure, and capacity building for educators

Source of Variation	Sum of Squares (SS)	Degrees of Freedom (df)	Mean Square (MS)	F-Ratio	p-value
Between Groups	0.54	3	0.18	4.50	0.005
Within Groups	2.56	796	0.032		
Total	3.10	799			

F (4.50) is significant (p = 0.005, which is < 0.05). This means there is a statistically significant difference in how respondents perceive different strategies. The highest mean score (3.4) suggests that "Collaboration between government, private organizations, and international agencies" is the most preferred strategy. Existing research supports this, showing that multi-stakeholder approaches drive better digital education outcomes (Adebayo & Eze, 2023). Capacity-building programs for educators are also crucial (Haruna, 2021). Private-sector investment remains a game changer but must be strategically aligned with policy frameworks (Akinola et al., 2023).

Conclusion

In conclusion, the study highlights the significant challenges hindering the effective adoption of digital education in Nigerian technical institutions, particularly infrastructural deficiencies such as unreliable electricity and limited internet connectivity, which severely impact access to digital learning. Financial constraints and outdated curricula further limit the accessibility and effectiveness of digital education, preventing students from acquiring relevant skills for the evolving job market. However, strategic interventions such as government policies, increased private-sector investment in digital infrastructure, and capacity-building programs for educators can enhance the successful integration of digital education. Addressing these challenges through a collaborative approach will ensure that technical education remains relevant, equipping students with the necessary digital competencies for the modern workforce.

Recommendations

1. To enhance the adoption of digital education in Nigerian technical institutions, the government, private sector, and educational stakeholders should collaborate to improve infrastructure by ensuring stable electricity, expanding internet accessibility, and providing affordable digital devices.
2. The government, educational institutions, and private stakeholders should work together to enhance digital education in technical institutions by increasing funding for digital infrastructure, subsidizing digital learning tools, improving internet connectivity, and updating curricula to integrate modern digital competencies.
3. A multi-stakeholder approach involving sustained government funding, strategic private-sector investment in digital infrastructure, targeted capacity-building programs for educators, and strengthened collaborations with international agencies should be prioritized to enhance the effective adoption of digital education in Nigerian technical institutions.

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